China's Manufacturing Performance in Comparative Perspective, 1980-1992

Szirmai, Adam; Ruoen, Ren

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Adam Szirmai and Ren Ruoen

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Institute of Economic Research*
Faculty of Economics
University of Groningen
P.O. Box 800
9700 AV Groningen - The Netherlands
tel. 31-50-633741
fax. 31-50-637337

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by

Adam Szirmai
Department of Technology and Development Sciences
Eindhoven University of Technology
P.O. Box 513,
5600 MB, Eindhoven
The Netherlands
Tel. 40-474021; Fax: 31-40-449171
E-Mail A.E.Szirmai@wmw.tue.nl

and

Ren Ruoen
School of Business Management
Beijing University of Aeronautics and Astronautics
37, Xueyuan Road
Beijing, 100083
China
Tel. 2026677-5433
Fax: 2015347

June, 1995

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1 Introduction

This paper presents results of an investigation into trends and levels in real output and labour productivity in Chinese manufacturing. The aims of the study are threefold. In the first place, we focus on a binary comparison of real output, gross value added and labour productivity in manufacturing in China and the USA for the benchmark year 1985 (sections 3, 4 and 5). This serves to put Chinese manufacturing performance in comparative perspective. It is of relevance for the ongoing debate about the level of Chinese per capita GDP. We show that use of industry of origin purchasing power parities instead of exchange rates approximately doubles Chinese value added in manufacturing, expressed in US dollars.

Secondly, we will present and discuss estimates of growth rates in fifteen sectors of manufacturing in section 6.

Finally, the benchmark comparison and the time series are combined to present a picture of relative labour productivity performance in Chinese manufacturing from 1975 to 1992 in section 7. From these binary comparisons with the USA, we derive inferential comparisons with productivity levels in other Asian countries.

Apart from presenting the empirical results, this paper discusses the relevant Chinese data sources and the conceptual and empirical problems involved in using Chinese census data in international comparisons.

This study is part of a larger project on international comparisons of output and productivity (ICOP) being carried out at the Universities of Groningen and Eindhoven and associated research groups.[1] For the benchmark comparison we apply a standardised industry of origin approach to international comparisons, developed within the ICOP project (see section 3). A major characteristic of this approach is that it does not use exchange rates as a converter, but derives specific purchasing power parities (PPPs) for different industries, branches and sectors of the economy.

In the longer run the aim of this project is to arrive at an industry of origin comparison for the whole of GDP, the results of which can be reconciled with those of an expenditure based comparison for the Chinese economy made by one of the authors (see Ren and Chen, 1993, 1994).

Summary of results

The geometric average of purchasing power parities at US and Chinese quantity weights found for total manufacturing is 1.45 yuan to the dollar. This is half the 1985 exchange rate of 2.9 yuan to the dollar. We estimate Chinese value added to have been 12.5 per cent of US value added and Chinese labour productivity (value added per person employed) to have been 4.8 per cent of the US level.

Separate PPPs have been calculated for each branch of manufacturing. These have been used to calculate relative labour productivity per branch. Highest labour productivity is found in electrical machinery and equipment (11.4% of the US level), leather products and footwear (10.8%) and metal products (9.5%). Low relative pro-

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[1] The ICOP project now covers some nineteen economies including five Asian ones. Most comparisons have been made for the manufacturing sector, but there are also comparisons involving agriculture, mining, construction and services (see Maddison and Van Ark, 1994; van Ark, 1993).

ductivity is found in machinery and transport equipment (2.9%), food manufacturing (2.8%), paper products, printing and publishing (3.2%) and wood products (3.6%).

The annual compound growth rate of net value added[2] in Chinese manufacturing from 1980 to 1992 is estimated at 7.6 per cent per annum. At branch level, the highest growth rates for value added were registered in tobacco (11%), electrical machinery and equipment (10.2%) and beverages (12.4%). Lowest growth rates were found for basic and fabricated metals (5.5%), textiles (4.2%), oil refining (3%) and wood products (1.6%).

From 1980 to 1992 value added per person employed in manufacturing increased by 3.4 per cent per annum and by 3.3 per cent per annum in "industry" (including mining, logging, manufacturing and utilities). Productivity performance varied substantially from branch to branch. Our figures suggest that labour productivity was declining in oil refining (-4%), textiles (-1.5%) and wood products (-0.8%). High productivity growth was registered in machinery and transport equipment (6.6%). Above average productivity growth was also found for electrical machinery and equipment (5.6%), wearing apparel (4.9%) and chemical products, excluding oil refining (4.6%).

In comparison with the United States, our most important finding is the absence of significant change in aggregate Chinese relative labour productivity between 1980 and 1992. Labour productivity decreased from 4.9 per cent of the US level in 1980 to 4.4 per cent in 1991. There was a sudden recovery to 4.9 per cent in 1992. At branch level the trends varied. There were productivity gains relative to the USA in food and beverages, wearing apparel, machinery and transport equipment, electrical machinery and equipment and non-metallic minerals. The most dramatic gains were found for tobacco products. Six of the remaining eight branches showed decreases in relative productivity. In textile mill products there was a quite dramatic decline from 8.2 per cent of the US level at the beginning of the 1980's to 4.6 per cent in 1992. The chemical products branch also showed a marked decline in relative performance.

We have compared Chinese labour productivity levels and trends with those in other Asian economies, including India and Indonesia. After excluding figures for small scale manufacturing, Chinese labour productivity in 1985 was between 7.2 and 7.6 per cent of the US level. This puts China in the same range as India, where labour productivity in medium and large scale manufacturing in 1985 was estimated at 7.7 per cent of the US level (see section 5 for more detail).

The preliminary nature of such comparative results, however, needs to be emphasized. In the first place, the Chinese census data only allow for a rough comparison between China and the USA. In the second place, there is no industrywide definition of the medium and large scale sector in China. One of the next steps in the research programme will be a direct China-India comparison. This allows for more detailed and refined product matches, than are possible in comparisons with the United States, due to greater similarity between products and production structures in Asian low income countries.

One main conclusion of this paper is that between 1980 and 1992 Chinese manufacturing was characterised by extremely rapid growth of production, but little

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[2] The Chinese term net output value refers to gross output value minus intermediate inputs. Depreciation is considered as an intermediate input. Thus this term corresponds to 'net value added'. (see section 4.2, point 1).

change in productivity relative to the United States. Given rapid productivity increases in Korea and Japan, the Chinese productivity gap relative to the leading Asian economies was even growing.

2 The Discussion about Levels of Chinese GDP

In the present debate about Chinese national accounts, there is a consensus that official statistics underestimate the level of national income (World Bank, 1992; Keidel, 1992; Taylor, 1991; Ren and Chen, 1993; Wu, 1993; Ma and Garnaut, 1992; Perkins, 1988). In this debate, one should distinguish between 1. estimates of the level of national income in yuan and 2. the conversion factors used to convert Chinese national income in yuan into other currencies for purposes of international comparisons.

Reasons for the underestimation of Chinese national income in yuan include:

1. Concepts. Until recently, Chinese national accounts were based on material product concepts. The system of material product accounts only reports material output and output in services making a direct contribution to the production of physical commodities. Output in health care, education, passenger transport, government administration and residential housing is not reported. At present Chinese national accounts are a hybrid between MPS and SNA. Adjustments are made for service output, but these may still be too low.
2. Incomplete coverage. The system of data collection is an administrative system, rooted in a planned economy. Enterprises which are part of the planning system, provide the statistical agencies with very detailed statistics. However, coverage is weakest in the booming private and semi-private sector of township and village enterprises and in rural services. Though moves are being made in the direction of sample surveys, the basis of the data collection system is still administrative reporting.
3. Low valuation of output due to pricing and subsidy conventions. In spite of liberalisation in the 1980's and early 1990's, many prices are still fixed at low levels and do not reflect scarcity relationships. In the Chinese statistical practice the emphasis is on quantities, rather than prices and values.
4. Provision of free or low cost services to employees by firms. Low valuation of such services leads to underestimation of value added.
5. Understatement of agricultural value added, due to low valuation of grain products and vegetables produced for own consumption.

Keidel (1992) estimates that China's 1987 GNP is 55 per cent higher than reported in official statistics. He bases this figure on three types of adjustments: 1. revaluation of sectoral financial flows so that the net operating surplus in each sector has a reasonable relationship to the value of productive assets in that sector; 2. adjustments for insufficient scope of the data, especially with regard to housing; 3. corrections made in the original input-output table to improve consistency and sector assignment of activities.

The discrepancies between official and adjusted data and between MPS and SNA are by far the largest for the service sector. For our purposes, it is important to note that the adjustments in the total industry sector (including mining) add up to zero, because the various adjustments cancel out (see Keidel, 1992, table 1.1). But in some subsectors of manufacturing Keidel makes negative adjustments to value added, which

derive from higher valuations of intermediate service inputs. For instance, for textiles the adjustment is -14 per cent, for consumer manufactures - 41 per cent.

In international comparisons, the use of official exchange rates as converters tends to underestimate the value of national income of low income countries in international currencies. One of the important reasons for this is the relatively low price of services in low income countries. In the case of China, the use of exchange rates invariably leads to lower estimates of Chinese GDP, than the use of purchasing power parities (Kravis, 1981; Summers and Heston, 1991; Ahmad, 1983; Taylor, 1991; for a discussion of alternative estimates of the dollar value of Chinese GDP see Ren and Chen, 1993, Ren and Chen, 1994).

Ma and Garnaut (1992) focus on the relationships between food consumption and GNP in Asian economies. Comparing Chinese food consumption per caput with that of other Asian economies such as Taiwan, Hong Kong, Singapore, Korea and Japan, they suggest that official GNP figures in dollars should be revised upward by a factor three. Of course, this figure depends heavily on the very rough assumptions they make and the assumed stability of the relationship between food consumption and national income across countries.

Ren and Chen (1993) calculate binary expenditure purchasing power parities for total GDP for 1986. Using their PPPs to convert Chinese GDP into dollars, they arrive at a figure of $ 1,044 per caput, which is 3.4 times the World Bank figure of $ 310 per caput in 1986 (Ren and Chen, 1994, table 7). The use of purchasing power parities has somewhat similar effects to the revaluation of Chinese national income by Keidel, based on shadow prices which reflect scarcity relationships.

In sections 4 and 5 we will derive industry of origin Purchasing Power Parities for the purposes of international comparisons. This will to a certain extent correct for the effects of price distortion on level comparisons, as production quantities in the countries being compared are valued at the same unit values. As in the case of other studies based on published statistical data, we are not able to correct for inadequate coverage of the underlying national data.

3 Methodology for the 1985 Level Comparison

The ICOP methodology for level comparisons has been described in detail in several publications (see Van Ark, 1993; Maddison and Van Ark, 1988, 1994; Szirmai and Pilat, 1990a). Here, we provide only a brief outline of the methods used.

The primary sources used in this study were the US *1987 Census of Manufactures* and the Chinese *Industrial Census 1985* (Vol. I-X, 1987-1988). These sources provide information on product quantities and gross output values, making it possible to derive unit values for large numbers of products.

The basic approach is to make matches of comparable products or product groups from the two censuses and to calculate unit value ratios for each of the matches. The matches were made for 23 'sample industries', i.e. comparable industries selected from the two censuses. The sample industries on the US side consist of one or more four digit industries. The Chinese census is not classified by industry codes. However, it is possible to identify industries similar to those in the US census on the basis of the descriptions of products.

The unit value ratios are used to calculate PPPs in a number of steps. First all the unit value ratios are aggregated at sample industry level using output quantities of either countries as weights:

$$PPP_j^{XU(X)} = \frac{\sum_{i=1}^{s} (Q_{ij}^{X} * P_{ij}^{X})}{\sum_{i=1}^{s} (Q_{ij}^{X} * P_{ij}^{U})} \qquad PPP_j^{XU(U)} = \frac{\sum_{i=1}^{s} (Q_{ij}^{U} * P_{ij}^{X})}{\sum_{i=1}^{s} (Q_{ij}^{U} * P_{ij}^{U})} \tag{1}$$

where

$PPP_j^{XU(X)}$	is the purchasing power parity of the Yuan (China's currency) against the US dollar in sample industry j, at quantity weights of China;
$PPP_j^{XU(U)}$	is the purchasing power parity of the Yuan against the US dollar in industry j, at quantity weights of the USA
i= 1...s	is the sample of matched items

The initial sample industry PPPs are based on 1987 US unit values and 1985 Chinese unit values. The PPPs are put on a 1985 basis, using sample industry price deflators for the USA (see section 4.2, point 9 for the calculation of the price deflators).

Next, the 1985 sample industry PPPs are aggregated at branch level by taking the weighted average of sample industry PPPs using 1985 sample industry gross value added as weights:

$$PPP_k^{XU(U)} = \frac{\sum_{j=1}^{o} [GVA_j^{U(U)} * PPP_j^{XU(U)}]}{\sum_{j=1}^{o} GVA_j^{U(U)}} \qquad PPP_k^{XU(X)} = \frac{\sum_{j=1}^{o} GVA_j^{X(X)}}{\sum_{j=1}^{o} [GVA_j^{X(X)} / PPP_j^{XU(X)}]} \tag{2}$$

where

$GVA_j^{U(U)}$	is gross value added in US sample industry j in dollars
$GVA_j^{X(X)}$	is gross value added in Chinese sample industry j in Yuan
k	branch of industry
j=1..o	sample industries belonging to a branch k

Manufacturing branches in this study consist of one or more ISIC three digit major sectors. In three instances, wood products, paper products and non-metallic mineral products, a branch coincides with a two digit ISIC division.

TABLE 1
Coverage Ratio: Gross Value of Matched Output as % of Total Gross Value of Output in Sample Industries

Branch and Sample Industries within the Branch	China 1985	USA 1987	Number of Matches
1. FOOD MANUFACTURING	57.1	30.7	22
1 Meat Products	51.5	75.4	5
2 Dairy Products (a)	100.0	62.0	7
3 Fats and Oils	34.1	72.4	3
4 Grain Mill Products	94.3	39.3	4
5 Sugar & Sugar Factories	95.9	68.1	2
6 Confectionery Products	100.0	27.8	1
2. BEVERAGES	13.1	27.5	1
7 Malt and Malt Beverages	100.0	91.9	1
3. TOBACCO AND TOBACCO PRODUCTS	10.6	15.2	3
8 Tobacco and Tobacco Products	10.6	15.2	3
4. TEXTILE MILL PRODUCTS	69.8	51.2	7
9 Textile Yarn and Cloth	80.2	88.6	7
5. WEARING APPAREL			0
6. LEATHER PRODUCTS AND FOOTWEAR	42.9	43.7	1
10 Leather Footwear	100.0	91.9	1
7. WOOD PRODUCTS, FURNITURE AND FIXTURES	40.0	19.7	2
11 Sawmills, Planing and Other Woodmills	78.3	45.2	2
8. PAPER PRODUCTS, PRINTING & PUBLISHING	64.0	11.9	4
12 Pulp and Paper	100.0	38.6	4
9. CHEMICALS, PETROLEUM & COAL PRODUCTS	30.6	25.5	10
13 Agricultural Fertilisers	99.7	86.4	3
14 Soap and Detergents	100.0	33.9	2
15 Petroleum refining	63.7	70.9	5
10. RUBBER AND PLASTIC PRODUCTS	30.7	3.2	4
16 Tires and Inner Tubes	34.6	20.9	2
17 Rubber and Plastic Footwear	100.0	16.9	2
11. NON-METALLIC MINERAL PRODUCTS	56.9	7.8	3
18 Bricks	79.8	72.2	2
19 Cement	100.0	65.9	1
12. BASIC AND FABRICATED METAL PRODUCTS	48.5	14.7	2
20 Iron and steel	88.5	70.8	2
13. MACHINERY & TRANSPORT EQUIPMENT	10.8	20.8	4
23 Motor Vehicles and Equipment	67.2	52.8	4
14. ELECTRICAL MACHINERY & EQUIPMENT	20.1	5.1	4
21 Radio and TV Receivers	98.2	88.1	2
22 Lamps and Bulbs	53.8	84.9	2
15. OTHER MANUFACTURING			
TOTAL MANUFACTURING	37.1	18.9	67

Note (a) Comparison at US unit values only.

Finally, the branch PPPs can be aggregated into PPPs for total manufacturing, using branch value added weights according to equation 2. The rationale behind these

weighting procedures is to ensure that unit value ratios in large sample industries and branches receive heavier weights than in small ones (see Van Ark, 1993).[3]

At each level of aggregation - sample industry, branch and total manufacturing - the PPPs can be used to convert value added into the currency of the other country for purposes of real value added comparisons. In theory it would be preferable to calculate PPPs for both inputs and outputs, thus achieving double deflated comparisons. In practice there is insufficient information on quantities and values of inputs. Therefore ICOP studies have generally applied output PPPs to value added.

It should be stressed that in binary comparisons one gets two PPPs at every level of aggregation, one at quantity weights of country X, the other at quantity weights of country U. If, as is often the case when one compares a low income country with an advanced economy, the production structure is very different, the PPPs may differ quite substantially. We use the Fisher geometric average of the two PPPs as a summary measure.

At this stage of the research project, we have made 67 product matches in 23 sample industries, representing 13 out of a total of 15 branches of manufacturing. Table 1 shows the coverage ratios at branch and sample industry levels. The matched value of output represents 37.1 per cent of the total gross value of output in China and 18.9 per cent in the USA. The table shows that with the exception of food manufacturing and chemical products, the number of matches per branch is still rather limited. This is due to the lack of detailed value information in the Chinese census (see next section).

4 Data Sources and Problems

4.1 Data Sources

The first post-war industrial census in China was held in 1950. The source for the present study is the second national industrial census held in the first quarter of 1986 and referring to the calendar year 1985. The basic reporting unit was the 'independent accounting industrial enterprise'. The characteristics of an independent accounting enterprise defined by the compilers of the census were: 1. possession of an independent administrative organisation; 2. being able to account independently for profit and loss; 3. being empowered to sign contracts with other units. Enterprises can be both single product and multiple product firms (see PRC, 1988, explanatory notes). The census aims at complete coverage of all enterprises.

Besides information on manufacturing proper, the industrial census also provides information on mining and logging which are normally categorised as primary activities, and on electricity, gas and water supply which are normally classified as utilities. The complete results are reported in a ten volume Chinese publication: *Industrial Census 1985* by the Office of Leading Group of the National Industrial Census under the State Council, (PRC, Statistics Press House of China, 1987-1988).

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[3] Sometimes it is possible to improve the coverage by making a some interesting matches outside the sample industries. In these cases, we used all matches made within the branch, including the matches outside the sample industries, to calculate a PPP for the non-sampled part of the branch. This PPP received the value added weight of the non-sample industry part of the branch in calculating the overall branch PPP.

Results for Large and Medium Sized enterprises are reported in English in People's Republic of China, *Industrial Census 1985 (Large and Medium-Sized Enterprises)*, Hongkong, Economic Information and Agency, June 1988.[4]

The Chinese edition of the census provides detailed lists of quantities of products produced (*Industrial Census 1985*, Vol. 10). This volume includes some 4800 items (excluding mining, logging and utilities) in 56 manufacturing industries.[5] However, closer inspection shows that there is considerable double counting. The same products are subcategorised in various ways and subtotals seldom add up to totals. So the product list can only be used after very detailed screening.

Unfortunately the tables with product quantities in volume 10 of the census do not contain any information on the gross value of output of each of the products listed. Information on gross value of output is only available for a much shorter list of product categories (about 600, see *Industrial Census 1985*, Vol. 3, pp. 90 ff). The detailed products from volume 10 have been combined so as to correspond with the product categories of Vol. 3.

It is clear that only very rough unit values can be calculated for larger product categories. At a later stage it might well be useful to supplement census information on value of output with value or price information from other sources, such as yearbooks of administrative prices compiled by the State Statistical Bureau. Sometimes price ratios from other sources such as the *China Statistical Yearbook* can be applied to average unit values for product categories, to derive more detailed unit values.

The data on Chinese gross value of output and gross value added by branch of ~~industry~~ in table 2 are basically derived from a table in volume 3 of the industrial census (pp. 90 ff.). This table provides information on gross value of output and 'net industrial output' at market prices. First we adjusted Chinese output and value added at market prices to factor cost by deducting an estimate of indirect taxes. These indirect taxes were calculated by applying the ratio of indirect taxes to sales values (Census, Vol. 3, pp. 596 ff.) to gross value of output at market prices.

The Chinese concept of 'net industrial output' corresponds to the US census concept of 'net value added'. It excludes depreciation, which is considered as part of intermediate input in Chinese national accounts and in the industrial census. We adjusted net value added (at factor cost) to gross value added (at factor cost) by adding figures on depreciation given in an another table of volume 3 of the census (pp. 564 ff.). As service inputs from outside ~~manufacturing~~ are not included in intermediate input in the Chinese census, our Chinese figures for gross value added are consistent with the US census concept of value added. (For more detail see section 4.2, points 1 and 2.). A table in volume 8 (pp. 2 ff.) provides the employment figures.

At this stage it is not clear whether the information by industry on gross output, value added and employment in China is based on a commodity classification

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[4] This source contains no definition of large and medium sized enterprises. In 1985 large and medium sized enterprises accounted for 1.79% of the total number of enterprises in the industrial sector, 54.6% of net value added at current prices and 33.4 % of average employment (PRC, 1987/88, PRC, 1988). Net value added per person employed is 64% higher in medium and large sized enterprise than in total manufacturing (7044 yuan per person employed against 4307 yuan per person employed).

[5] The Chinese Industrial Census does not use any classification code system. We obtained 56 manufacturing industries by matching the Chinese Industrial Census to ISIC.

(irrespective of whether commodities in a given category are produced as primary or secondary products) or on an industry classification including both the primary and the secondary products of that industry. On the one hand, we know that data are collected on an enterprise basis with enterprises often producing many products belonging to different industries. On the other hand, the census classification seems to be based on a commodity classification. This question needs to be examined further.

For the USA our basic source was the *1987 Census of Manufactures* (US Dept. of Commerce, 1990), which lists approximately 11000 products. For most, though not all, products the US census provides both quantity and value information for 1987. 1987 unit values were put on a 1985 basis using information from *US Industrial Outlook 1989* (US Dept. of Commerce, 1989) and figures from the *Annual Survey of Manufactures*, which are reproduced in the 1987 Census (see section 4.2, point 9 for more detail).

The data on gross value of output (value of shipments), gross value added and employment by branch of industry in 1985 also derive from the 1987 census. The census provides information on gross output, gross value added and employment by industry for years prior to 1987 including the benchmark year 1985. These data originally derive from the *Annual Survey of Manufactures.*

In the US census industry data on gross output value, gross value added and employment are on an establishment basis, referring both to production primary to the industry in question and secondary production. The product listings are arranged by product, irrespective of whether the products are produced as primary products of some industries or secondary products of other industries. Therefore the industry gross output totals are different from the gross output totals calculated from the product listings.

In the case of China, we used the same table from the census (Vol. 3, pp. 90 ff.) for the gross value of output of (groups) of commodities for purposes of matching and for gross value of output and gross value added by sample industry and by branch of manufacturing.

The basic data on gross value of output, gross value added and employment are presented in tables 2 and 3.

TABLE 2
Basic Data on Output, Employment and Productivity for China, 1985
Industrial Census

	Gross Value of Output at factor cost (mill. Yuan) (a) (1)	Gross Value Added at factor cost (mill. Yuan) (b) (2)	Gross Value Added in Branch as % of Total (3)	Employment (persons) (4)	Employment excl. Service Employment (c) (5)	Number of Enterprises (6)	Gross Value added per person employed (7)	Gross value added per person (excl. service employment) (8)
1 Food Manufacturing	63,386.0	8,544.6	4.7	3,028,400	2,771,812	41,841	2,821.5	3,082.7
2 Beverages	12,856.4	3,217.1	1.8	975,300	907,777	13,197	3,298.5	3,543.9
3 Tobacco Products	8,954.4	488.5	0.3	225,400	204,142	313	2,168.9	2,394.7
4 Textile Mill Products	97,532.6	18,737.7	10.3	6,830,400	6,194,181	18,846	2,743.3	3,025.1
5 Wearing Apparel	16,380.6	4,341.9	2.4	1,997,800	1,890,600	18,196	2,173.4	2,296.6
6 Leather Products and Footwear	7,982.7	1,931.1	1.1	825,600	774,140	1,079	2,339.1	2,494.6
7 Wood Products, Furniture & Fixtures	9,917.6	2,907.3	1.6	1,434,800	1,316,469	19,736	2,026.5	2,208.7
8 Paper Products, Printing & Publishing	22,092.6	6,249.9	3.4	2,124,400	1,963,345	17,576	2,942.0	3,183.3
9 Chemicals Products (incl. oil refining)	92,887.2	25,141.4	13.8	4,622,400	4,034,258	17,654	5,439.0	6,232.0
10 Rubber and Plastic Products	25,385.9	6,485.5	3.6	1,875,500	1,726,289	13,982	3,458.0	3,756.9
11 Non-metallic Mineral Products	37,525.7	15,148.9	8.3	6,598,600	6,159,593	48,291	2,295.8	2,459.4
12 Basic & Fabricated Metal Products	89,090.4	24,095.4	13.3	5,816,300	5,076,180	29,615	4,142.7	4,746.8
13 Machinery & Transport Equipment	124,288.9	41,505.5	22.8	11,606,600	10,207,956	53,265	3,576.0	4,066.0
14 Electrical Machinery & Equipment	56,100.7	16,316.6	9.0	3,534,200	3,170,020	14,901	4,616.8	5,147.2
15 Other Manufacturing Industries	20,186.6	6,702.2	3.7	2,353,500	2,184,678	17,683	2,847.8	3,067.8
Total Manufacturing	684,568.3	181,814.1	100.0	53,849,200	48,581,439 (d)	326,175	3,376.4	3,742.5

Sources:
Col. 1: Gross value of output at market prices from PRC, *Industrial Census 1985*, Vol. 3, pp. 90 ff., adjusted to factor cost by subtracting indirect taxes calculated from *Industrial Census 1985*, Vol. 3, pp. 596 ff.
Col. 2: Net value added at market prices from *Industrial Census 1985*, Vol. 3, pp. 90 ff. Adjusted to gross value added by adding depreciation from *Industrial Census*, Vol. 3, pp. 564 ff.: Table "Fixed Capital and Flow of Funds for Total Industry", adjusted to factor cost by subtracting the estimate for indirect taxes used in column 1.
Col. 4: Employment (annual average) from *Industrial Census*, Vol. 8, p. 2 ff.
Col. 5: Column 4 minus number of employees supplying services (end of year) from *Industrial Census*, Vol. 8, p. 18 ff.
Col. 6: Number of enterprises from *Industrial Census*, Vol. 3, pp. 90 ff.

Notes: (a) Ratio of indirect taxes to sales revenues from *Industrial Census*, Vol. 3, pp. 596 ff. applied to gvo at market prices from *Industrial Census*, Vol. 3, pp. 90 ff.
(b) US census concept of value added. Gross value added calculated by adding depreciation to net value added.
(c) Employment excluding workers producing auxiliary services such as health care, education and housing
For end of year employment, data are available for employment excluding service employment (Vol. 8, p. 18 ff.)
We applied the end of year ratio of employment excluding service employment to total employment to total average employment to derive average employment excluding service employment in column 5.
(d) Small discrepancy between calculated and published total.

TABLE 3
Basic Data on Output, Employment and Productivity for the United States, 1985
Census of Manufactures

	Gross Value of Output at factor cost (mill. US$)	Gross Value Added at factor cost (mill. US$)	Gross Value Added in Branch as % of Total	Employment (a) (persons)	Employment in branch as % of Total	Gross Value Added per Person
	(1)	(2)	(3)	(4)	(5)	(6)
1 Food Manufacturing	258,318.2	84,853.3	8.5	1,331,725	7.1	63,716.9
2 Beverages	43,243.8	19,292.7	1.9	197,109	1.0	97,878.1
3 Tobacco Products	18,506.8	11,893.7	1.2	69,893	0.4	170,171.0
4 Textile Mill Products	53,276.5	20,693.3	2.1	684,756	3.6	30,220.0
5 Wearing Apparel	56,993.1	27,728.4	2.8	1,091,743	5.8	25,398.3
6 Leather Products and Footwear	8,567.2	4,107.5	0.4	154,319	0.8	26,616.9
7 Wood Products, Furniture & Fixtures	85,478.9	37,544.3	3.8	1,108,444	5.9	33,871.2
8 Paper Products, Printing & Publishing	205,277.9	113,476.6	11.3	2,082,718	11.1	54,484.9
9 Chemicals, incl. petrol. refining	376,446.2	112,369.1	11.2	1,212,252	6.4	92,694.5
10 Rubber and Plastic Products	71,324.0	35,708.3	3.6	770,989	4.1	46,314.9
11 Non-metallic Mineral Products	55,112.0	28,877.7	2.9	550,384	2.9	52,468.3
12 Basic & Fabricated Metal Products	250,110.7	107,400.0	10.7	2,291,459	12.2	46,869.7
13 Machinery & Transport Equipment	516,624.7	231,388.6	23.1	4,059,265	21.6	57,002.6
14 Electrical Machinery & Equipment (b)	154,898.3	85,708.5	8.6	1,728,419	9.2	49,587.8
15 Other Manufacturing Industries (b)	126,005.5	79,100.0	7.9	1,462,926	7.8	54,069.7
Total Manufacturing	2,280,183.8	1,000,142.0	100.0	18,796,400 (c)	100.0	53,209.2

Source: US Dept. of Commerce, Bureau of the Census, *US 1987 Census of Manufactures, General Summary*, Washington DC, 1990, table II.1. (Original source for 1985, US Dept. of Commerce, Bureau of Census, *Annual Survey of Manufactures*). Head office and auxiliary employment for 1987 from table II.6.

Notes: (a) including head office employment and employment in auxiliaries (some 8% of the total). For 1985 no data on head office and auxiliary employment were available. The employment figures for 1985 are multiplied by the 1987 ratio of total employment including head office and auxiliary employment to employment excluding these categories for 1987.

(b) No ASM data for 1985 included in the 1987 census, due to substantial recategorisation of the activities in these branches in the revision of the US Standard Industrial Classification in 1987. The original 1985 figures in the 1985 edition of the *Annual Survey of Manufactures* are not useful for our purposes as they are still based on the 1972 SIC classification. We derived estimates of value of output, value added and employment in electrical machinery and equipment and other manufacturing by subtracting the 1985 summed totals for all other branches from 1985 total figures for manufacturing and applying 1987 proportions to distribute gvo, gva and employment over the two branches.

(c) The auxiliary employment component (1288100) of total employment from *Annual Survey of Manufactures*, 1985.

4.2 Concepts, Adjustments and Outstanding Problems

This section presents a discussion of the conceptual and methodological issues involved in comparisons of output and productivity based on industrial census data of China and the USA. The discussion focuses on the Chinese data. US sources have been extensively discussed in recent ICOP publications (e.g Szirmai and Pilat, 1990; Maddison and van Ark, 1994b, van Ark and Pilat, 1994).

1. The Chinese census provides information on 'net industrial output' which corresponds to the concept of 'net value added'. The *Explanation to the Industrial Economic Indicators* defines net industrial output as follows (SSB, 1987a, p. 48, see also census Vol. I. p. 669):
   Net industrial output (net value added) is gross value of output minus intermediate inputs.
   The gross value of output comprises value of finished goods, value of processing work, maintenance and value of semi-finished goods (Census, Vol. I, p. 669).
   Intermediate inputs include:
   A1: Material inputs from outside the enterprise
   A2: Fuel for energy excluding taxes
   A3: Electricity
   A4: Depreciation
   A5: Reserve funds for maintenance
   A6: Other expenditure for material consumption a: material; b non-material (services)
   A7: Sales costs related to physical production (e.g. boxes, shelves)
   A8: Value of intermediate inputs provided by customers to be processed in the enterprise.

   Chinese value added as defined above is net of depreciation. Depreciation is considered as part of intermediate input. To compare with gross value added in the United States, we added depreciation to the net value added which is given in a separate table in the Chinese census (see Vol. 3, pp. 564 ff.).

   The 1985 Chinese census was still carried out within a Material Product System (MPS) conceptual framework. However, as the output concept in the manufacturing sector refers to the value of physical production, the conceptual discrepancies between MPS and the System of National Accounts (SNA) in this sector are far less troublesome than in the service sector.
2. Gross value added in the US census is measured without deducting the cost of services purchased from outside the manufacturing sector. The concept of value added in the Chinese census ('net industrial output') is consistent with the US census concept.
   The only Chinese reference to services in the list of intermediate inputs discussed under point 1 above is item A.6: 'other expenditure for material consumption (non-material)'. This category almost certainly excludes services purchased outside manufacturing. Thus, once Chinese value added has been put on a gross rather than a net basis, it is consistent with the US census concept of value added.

3 Chinese enterprises provide a variety of welfare and other services to their employees. These include health care, child care, education, recreational facilities, meals and housing. The value of these services is not included in gross value of output or gross value added. This means that gross output and gross value added are understated. However, on an SNA basis service output would be reallocated to the service sector. So the effect of neglect of these services in Chinese manufacturing statistics does not affect the real output comparisons with the United States for the manufacturing sector itself.

4. More serious problems arise with regard to comparisons of labour productivity. Chinese census employment figures for manufacturing include the various categories of employees who produce the services mentioned above. As gross output and gross value added figures exclude the value of these services, the use of unadjusted employment figures provides a strong downward bias to Chinese labour productivity figures.

We have tried to adjust for this source of bias. Volume 8 (pp. 18 ff) of the industrial census provides information on numbers of persons providing services within manufacturing. On average 9.8% of total manufacturing employment is in service activities. In column 5 of table 2, we have calculated employment excluding services. These are used as the labour input figures in the subsequent tables.

Even after this adjustment, labour productivity figures may still be biased downwards. 9.8 per cent seems to be a rather modest estimate of the extent of service employment in manufacturing.

5. The gross value of output figures for the commodities listed in the Chinese census include indirect taxes (State Statistical Bureau [SSB], 1993a). The gross value of output in the US census is at factor cost. The inclusion of indirect taxes in China means that unit value ratios and PPPs are biased upwards.

At sample industry level one can readjust PPPs, if one has information on indirect taxes. In the Chinese census indirect taxes as a proportion of gross value of output at market prices are not available. The census does supply information on indirect taxes in a table on total sales revenues (Vol. 3, p. 596 ff.). We applied the ratio of indirect taxes to sales revenues to gross value of output at market prices to derive estimates of indirect taxes at sample industry and branch levels.

Subsidies are not included in Chinese gross value of output. In Chinese statistical practice, the subsidies are reported as a negative income to the government, but they are not regarded as positive income of enterprises. Therefore, there was no need to readjust PPPs for subsidies.

6. At industry level, the US census employment figures exclude people in head offices and auxiliary establishments. As the Chinese data are on an enterprise basis, head office and auxiliary employment is included in the employment figures (SSB, 1993a). US employment figures were adjusted to include head office and auxiliary employment at branch level, using information from the general summary volume of the census. This information was only available for 1987. We used 1987 proportions to adjust the employment figures for 1985.

7. Chinese census returns are made by enterprises, rather than by establishments as in the USA. However, the data on production quantities, gross value of output, value added and employment are arranged in such a way that they seem to refer to the typical products produced by specific industries. Data collected from

enterprises usually refer to a wide range of productive activities. The way in which such heterogeneous data are rearranged into more homogeneous categories which correspond to an industry classification, needs to be examined further.

8. The US census product listings show gross value of shipments rather than gross value of output, thus excluding changes in inventories. In the Chinese census the output data refer to gross value of output, including changes in inventories.

   One might argue that centrally planned economies are characterised by huge inventories, considerable part of which will be junked rather than eventually sold. This could create un upward bias in real output comparisons between China and the USA.

   On the other hand, the difference between value of shipments and value of output consists of the value of annual changes in inventories, irrespective of the overall level of inventories. Inventory changes are a very small proportion of gross output in the USA. Annual production of unsaleable items in China, leading to increases in inventories, might create some upward bias in the productivity comparisons for a given year. In our judgement, however, this is not a major source of bias. We have not attempted to correct for it.

9. The Chinese census listing of products refers to 1985, the US census listing of products to 1987. In the first round the industry PPPs were computed on the basis of the two censuses, using Chinese 1985 unit values and US 1987 unit values. Subsequently the PPPs were adjusted to a 1985 basis using US price deflators for each sample industry for the period 1985-1987.

   These sample industry price deflators were calculated as follows. The *US Industrial Outlook 1989* provides gross value of output by industry in constant 1982 dollars for both 1985 and 1987. The volume ratio of 1985 to 1987 in constant prices calculated from the *US Industrial Outlook*, is applied to 1987 output in 1987 dollars from the *1987 Census of Manufactures*, resulting in 1985 output in 1987 dollars. Finally, one divides the figure for 1985 output in 1987 dollars by figures for 1985 output in 1985 current prices from the *Annual Survey of Manufactures* to derive an index for 1985-1987 price changes (see Szirmai and Pilat, 1990a for a more detailed discussion of this procedure).

10. The Chinese product listings are extremely detailed. On closer inspection, however, it turns out that the production per industry is often categorised in ways which are not mutually exclusive, e.g by quality of inputs, by size, by use etc. Therefore, items seldom add up to category totals and the product listings had to be screened very closely before they could be used.[6]

11. The information on the gross value of industrial output is collected on an enterprise basis and refers to roughly defined categories of products. The Chinese census contains little detailed information on output values of specified products, which could be used to calculate unit values.

    The Chinese unit value values in this study were derived by combining gross value of output figures from Volume 3 of the census, with quantity information from Volume 10 of the census. Volume 3 provides some 600 output values for roughly defined categories of products. The scanty value information limited the

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6 In the worksheets, we have included the complete Chinese product listings. (For an example see Annex Table A. 11.) When totals were subcategorised in more than one way, we took care to use only one of the subcategorisations in the matching tables.

number of commodities or commodity groups for which unit values could be calculated. It was also not always perfectly clear whether the categories for which output values were available, were exactly identical to the categories from the commodity listing for which quantity information was available. As a result the unit values are of an extremely rough nature. The tentative nature of our findings should be emphasized.

12. In sample industry dairy products, the value information on the Chinese side was so limited, that we only made a 'Paasche' comparison, applying US prices to Chinese quantities. We applied the average ratio of Laspeyers to Paasche PPPs to calculate a proxy Laspeyeres for this sample industry.
13. The Chinese quantity information is far more detailed than the value information. As mentioned under point 11, the reason for this is that value information is only reported for larger product categories on an enterprise basis (see SSB, 1987a). On a quantity basis we could have made many more and more refined matches. Two alternative avenues could be explored in further research. In the first place, one could put the whole comparison on a Paasche basis, consistently applying US prices to Chinese quantities. The second alternative would be to go outside the published census information and use the long lists of Chinese administrative prices which are available for 1980 and 1990 and update or backdate these to 1985. (For the updating of the 1980 administrative prices, we could calculate implicit 1980-1985 price indices from the census, by comparing 1985 output in current prices with 1985 output at 1980 prices).

    If such detailed price information could be matched with the quantity information, many more matches would be possible. This avenue will be explored in the next phase of this research project.

4.3 Reconciliation between the 1985 Chinese Census and the 1987 Chinese Input-Output Table

The present benchmark study is based on the industrial censuses of the two countries. The censuses are the most reliable source for labour productivity comparisons, because both the labour input figures and the value added figures derive from one and the same source. It is important, however, to compare census data with other data sources such as input-output tables and national accounts. Previous ICOP studies have shown that there can be considerable discepancies between these sources which can affect the productivity comparisons and especially the level comparisons of national income (see e.g. Maddison and van Ark, 1988; Szirmai and Pilat, 1990b).

A first step towards such a reconciliation for China is presented in table 4. Here we compare data for manufacturing from the 1985 census, the 1987 input-output table and the *1993 Industrial Economy Statistics Yearbook*. The data from these three sources have been rearranged into 15 ICOP branches. The census data have been readjusted from net value added at market prices to gross value added at market prices, by adding depreciation (see footnotes to table 2). The census concept of value added includes service inputs from outside manufacturing. This concept involves more double counting than the national accounts concept of value added, which excludes such service inputs. The input-output table provides a national accounts concept of value added. The aggregates from the input-output table are very similar to the national accounts aggregates published in editions of the China Statistical Yearbook.

The 1987 input-output table is made up out of building blocks from which one can reconstruct both SNA and MPS concepts. Here we use the SNA concepts. The 1987 data have been recategorised into 15 ICOP branches and have subsequently been backdated to 1985 using time series of current net value added per branch of manufacturing from the *1993 Industrial Economy Statistics Yearbook* (see Annex table A.1).

The *1993 Industrial Economy Statistics Yearbook* presents data on gross value of output and net value added per branch of industry from 1980 to 1992. In table 4 we have reproduced the value added data for 1985, in order to be able to compare them with the census data.

The most disturbing finding in table 4 is the large discrepancy between manufacturing gross value added at market prices from the input-output table and from the census (306.1 billion against 247.5 billion yuan). This gap would be even larger, if we could compare both census and I-O tables at the national accounts concept of value added. The discrepancies between census and input-output tables are due to the fact that the input-output tables cover more activities than the census. The census is restricted to so-called 'independent accounting units' (see section 4.1). Activities of self-employed workers and other informal activities are excluded. On the other hand the branch proportions of value added are very similar.

For the comparison between the census and the yearbook of industrial statistics, we have included column 1 with net value added at market prices. The comparison confirms that yearbook data derive directly from the census.

Finally, table 4 points to a large gap between gross value added at market prices (col. 2) and gross value added at factor cost (col. 3) from the census. The factor cost concept has been constructed by deducting indirect taxes. If our factor cost concept turns out to be too low, our productivity comparisons would be biased downward.

These issues warrant further investigation, as does a reconciliation between census data and national accounts data.

TABLE 4
Reconciliation of Chinese Census Data, Input-Output Data and Data from the Industrial Economy Statistics Yearbook, 1985

	Census					Input-Output table		Yearbook	
	Net Value Added at market prices (mill. Yuan)	Value Added in Branch as % of Total	Gross Value Added at market prices (mill. Yuan)	Value Added in Branch as % of Total	Gross Value Added at factor cost (mill. Yuan)	Gross Value Added at market prices (mill. Yuan)	Value Added in Branch as % of Total	Net value added at market price (mill. yuan)	Value Added in Branch as % of Total
	(1)		(2)		(3)	(4)		(5)	
1 Food Manufacturing	9,868	4.3	10,850	4.4	8,545	13,271	4.3	9,868	4.3
2 Beverages	4,999	2.2	5,352	2.2	3,217	7,708	2.5	4,990	2.2
3 Tobacco Products	11,676	5.1	11,760	4.8	489	13,270	4.3	11,676	5.1
4 Textile Mill Products	25,050	11.0	26,849	10.8	18,738	33,152	10.8	25,050	11.0
5 Wearing Apparel	4,900	2.2	5,139	2.1	4,342	7,293	2.4	4,900	2.2
6 Leather Products and Footwear	2,209	1.0	2,357	1.0	1,931	3,110	1.0	2,209	1.0
7 Wood Products, Furniture & Fixtures	3,131	1.4	3,398	1.4	2,908	5,310	1.7	3,131	1.4
8 Paper Products, Printing & Publishing	7,259	3.2	7,948	3.2	6,250	10,630	3.5	7,259	3.2
9 Chemicals Products (incl. oil refining)	33,925	14.9	37,538	15.2	25,141	45,352	14.8	33,925	14.9
10 Rubber and Plastic Products	8,463	3.7	9,032	3.6	6,486	11,518	3.8	8,463	3.7
11 Non-metallic Mineral Products	16,242	7.2	18,111	7.3	15,149	25,016	8.2	16,242	7.2
12 Basic & Fabricated Metal Products	28,814	12.7	32,288	13.0	24,095	37,688	12.3	28,814	12.7
13 Machinery & Transport Equipment	44,168	19.4	48,754	19.7	41,506	53,219	17.4	44,168	19.4
14 Electrical Machinery & Equipment	18,847	8.3	20,135	8.1	16,317	24,143	7.9	18,847	8.3
15 Other Manufacturing Industries	7,546	3.3	8,021	3.2	6,702	15,366	5.0	7,547	3.3
Total Manufacturing (incl. oil)	227,096	100.0	247,532	100.0	181,814	306,047	100.0	227,089	100.0

Sources:
Column 1: (net value added): from PRC, *Industrial Census 1985*, Beijing, 1987/88, Vol. 3, p. 90ff.
Column 2: (gross value added at market prices): column 1 plus depreciation from *Census*, Vol. 3, pp. 564 ff.
Column 3 (gva at factor cost) derived from column 2 by subtracting indirect taxes. We applied the proportion of indirect taxes to sales revenues from Census, Vol. 3, pp. 596 ff. to gross value of output in order to get an estimate of indirect taxes.
Column 4: from SSB, *Input-Output Table 1987*, Beijing (1987c), backdated to 1985 using indices of production in current prices from *SSB, 1993 Industrial Economy Statistics Yearbook*, Beijing (1993c).
Column 5: SSB, *1993 Industrial Economy Statistics Yearbook*, Beijing, (1993c).

5 Results at Branch Level

PPPs were first calculated for 23 sample industries (see table 1).[7] Sample industry PPPs were aggregated into branch PPPs according to the procedure outlined in section 3. In table 5 this was done for thirteen branches of manufacturing. In eight of the thirteen branches, the branch PPPs were equal to the sample industry PPPs as there was only one sample industry in the branch. The PPP for other manufacturing is based on the quantity weighted average of all unit value ratios from all sample industries. The PPP for total manufacturing is the weighted average of branch PPPs, with value added weights. No matches were made in the wearing apparel branch, because of insufficient Chinese quantity information. For wearing apparel we used the weighted average of the PPPs for textile mill products and leather products and footwear.

The PPPs in table 5 are far below the exchange rate of 2.9 yuan to the dollar. The PPP for total manufacturing is 1.45. The relative price level (PPP/exchange rate) is 0.5. Lowest PPPs were found for tobacco products, followed by leather products, electrical machinery and beverages. The highest PPP (2.3) was found for machinery and transport equipment. Even this PPP was well below the exchange rate.

PPPs with US quantity weights are higher than PPPs with Chinese quantity weights. This is only be expected in binary comparisons between rich and poor countries. Both due to differences in production structure and consumer preferences, products which are relatively cheap and common in the USA, will tend to be expensive and rare in a low income country like China and vice versa. Therefore matches with high unit value ratios will receive high quantity weights in the USA and low ones in China. Matches with low unit value ratios will tend to receive low weights in the USA and high weights in China.

This pattern of PPPs far below the exchange rate is similar to that found in another ICOP study for another low-income Asian country, Indonesia (Szirmai, 1994). It may in part be caused by unrecognised quality differences for identical products, and a predominance of low quality items in the product mix in China, as compared to the USA. If the PPPs are biased downward, this means that productivity is biased upward. In this respect, therefore, our productivity estimates for China in table 7 - low as they are - represent an upper bound.

In part low PPPs reflect fixed administrative prices and subsidy conventions in China. To the extent that the PPPs really reflect lower price levels in China, they would point to a tremendous potential for exports, once the economy turns outwards. This is what has been observed in a country like Indonesia in the past ten years.

Comparisons of real gross value added are presented in table 6. On a census basis using the geometric average of PPPs, Chinese industrial GDP was 12.5 per cent of that in the USA. It is important to note that this figure is twice as a high as the figure one would find using exchange rates. To a considerable extent, the use of PPPs corrects for underestimation of Chinese GDP due to pricing distortions and fixed low

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[7] These PPPs can be applied to gross value added to derive comparisons of real gross value added at sample industry level. Division by employment figures gives labour productivity comparisons for the 23 industries. We have not reproduced the sample industry results here. They are available on request.

pricing conventions, because both Chinese and US production are evaluated at the same sets of prices.

Price distortions in China would only lead to too high estimates of Chinese GDP in dollars, if the downward distortion of prices relative to market shadow prices is unevenly distributed and concentrated in sectors or products, which have a higher share in total output in China than the USA. Though the degree and distribution of price distortion has not been analysed in this paper, we have no reason to believe that this will significantly affect the aggregate results of our productivity comparisons.

All PPP based estimates dollar estimates suggest that the use of the exchange rate substantially underestimates the dollar value of Chinese national income (Ren and Chen, 1994). But the assessment of the degree of underestimation varies considerably from study to study. Taylor's (1991) estimate is 2.5 times as high as the figure based on the exchange rate (Taylor, 1991). Very high estimates of Chinese national income in dollars are found by Kravis (1981). Estimates of GDP per capita based on Kravis' PPPs are 2.5 times as high as those of Taylor and more than six times as high as exchange rate based estimates (see for an overview Ren and Chen, 1994, table 7).

In a detailed expenditure based comparison between China and the USA, Ren and Chen (1993, 1994) found that a PPP based comparison put China's 1986 GDP in US dollars more than 3.4 times higher than an exchange rate comparison. Our PPP (geometric average) for manufacturing of 1.45 yuan per dollar is half the 1985 exchange rate of 2.9 yuan per dollar. This implies that Chinese real manufacturing output in dollars based on the PPP is twice as high as real output in dollars calculated with the exchange rate.

It is not surprising that the industry of origin PPP for manufacturing is so much lower than an expenditure PPP for the total economy. The price differences between rich and poor countries are by far the greatest in services, which are not included in this paper. Our industry of origin results for manufacturing are therefore not necessarily incompatible with Ren and Chen's expenditure based estimates for the total economy, including the service sector. As results of industry of origin estimates for other sectors of the Chinese economy come available, we will be able to look more closely at the reconciliation between expenditure and industry of origin estimates of Chinese national income.

TABLE 5
Purchasing Power Parities and Price Levels by Major Manufacturing Branch
China/USA (Yuan to the US$), 1985

	PPP (Yuan/US$) at US Quantity Weights	PPP (Yuan/US$) at Chinese Quantity Weights	PPP (Yuan/US$) Geometric Average	Relative Price Level China (USA = 100)
1/2Food and Beverages	1.62	1.43	1.52	52.5
1 Food Manufacturing (a)	1.77	1.53	1.64	56.7
2 Beverages	0.91	0.91	0.91	31.3
3 Tobacco Products	0.39	0.37	0.38	13.0
4 Textile Mill Products	1.49	1.44	1.47	50.5
5 Wearing Apparel (b)	1.37	1.39	1.38	47.5
6 Leather Products & Footwear	0.84	0.84	0.84	29.1
7 Wood Products, Furniture & Fixtures	1.73	1.73	1.73	59.7
8 Paper Products, Printing & Publishing	1.97	1.58	1.76	60.8
9 Chemical Products (incl. oil)	1.63	1.16	1.37	47.3
10 Rubber & Plastic Products	3.65	0.81	1.72	59.4
11 Non-metallic Mineral Products	1.14	0.52	0.77	26.6
12 Basic & Fabricated Metal Products	0.66	1.49	0.99	34.2
13 Machinery & Transport Equipment	2.85	1.92	2.34	80.6
14 Electrical Machinery & Equipment	0.96	0.77	0.86	29.7
15 Other Manufacturing Industries	1.81	1.17	1.45	50.1
Total Manufacturing (c)	1.84	1.15	1.45	50.1
Exchange Rate	2.9	2.9	2.9	

Source: The PPP for food manufacturing is the weighted average of the sample industry PPPs for meat products, dairy products (a), fats and oils, grain mill products, sugar and sugar factories and confectionery products with gross value added by sample industry serving as weights; the PPP for leather products and footwear is the PPP for leather footwear; the PPP for chemicals products is the weighted average for agricultural fertilisers, soap and detergents and oil refining; the PPP for rubber and plastic products is the weighted average for tires and tubes and rubber and plastic footwear; the PPP for non-metallic mineral products is the weighted average for bricks and cement; the PPP for basic and fabricated metal products is the PPP for iron and steel; the PPP for machinery and transport equipment is the PPP for motor vehicles and equipment; the PPP for electrical machinery and equipment is the weighted average for radio and tv receivers, lamps and bulbs; the PPP for other manufacturing is the weighted average of all product unit value ratios.

Notes: (a) For sample industry dairy products only a Paasche PPP at Chinese quantity weights could be calculated. We derived a proxy Laspeyres PPP for this sample industry by applying the average Laspeyres to Paasche ratio for all sample industry PPPs.

(b) No sample industries in this branch. The PPP for wearing apparel is the weighted average of the PPPs for textiles and leather products and footwear.

(c) The PPP for total manufacturing is the weighted average of the PPPs of all manufacturing branches, weighted with census value added weights.

TABLE 6
Gross Value Added (Census Concept), by Major Manufacturing Branch
China and the USA, 1985

	at Chinese unit values			at US unit values			Geometric Average
	China	USA	China/ USA	China	USA	China/ USA	China/ USA (%)
	(in million Yuan)		(%)	(in million US$)		(%)	
Food and Beverages	11,761.6	167,611.8	7.0	9,143.8	104,146.0	8.8	7.8
1 Food Manufacturing	8,544.6	150,103.6	5.7	5,598.9	84,853.3	6.6	6.1
2 Beverages	3,217.1	17,508.2	18.4	3,544.8	19,292.7	18.4	18.4
3 Tobacco Products	488.5	4,608.6	10.6	1,325.2	11,893.7	11.2	10.9
4 Textile Mill Products	18,737.7	30,852.2	60.7	13,015.6	20,693.3	62.9	61.8
5 Wearing Apparel	4,341.9	37,990.6	11.4	3,133.3	27,728.4	11.3	11.4
6 Leather Products and Footwear	1,931.1	3,463.9	55.8	2,290.0	4,107.5	55.8	55.8
7 Wood Products, Furniture & Fixtures	2,907.7	65,032.6	4.5	1,679.4	37,544.3	4.5	4.5
8 Paper Products, Printing & Publishing	6,249.9	223,373.0	2.8	3,952.1	113,476.6	3.5	3.1
9 Chemical Products, incl. oil	25,141.4	182,653.2	13.8	21,756.5	112,369.1	19.4	16.3
10 Rubber and Plastic Products	6,485.5	130,510.7	5.0	7,979.2	35,708.3	22.4	10.5
11 Non-metallic Mineral Products	15,148.9	33,019.9	45.0	29,180.4	28,877.7	101.1	68.1
12 Basic & Fabricated Metal Products	24,095.4	70,904.3	34.0	16,170.9	107,400.0	15.1	22.6
13 Machinery & Transport Equipment	41,505.5	659,507.9	6.3	21,645.3	231,388.6	9.4	7.7
14 Electrical Machinery & Equipment	16,316.6	82,553.5	19.8	21,184.3	85,708.5	24.7	22.1
15 Other Manufacturing Industries	6,702.2	143,187.2	4.7	5,744.7	79,100.0	7.3	5.8
Total Manufacturing	181,814.1	1,835,269.6	9.9	158,200.5	1,000,142.0	15.8	12.5

Source: Census value added in national currency from tables 2 and 3 converted with PPPs from table 5

TABLE 7
Gross Value Added (Census Concept) per Person Employed by Major Manufacturing Branch, China and the USA, 1985

	at Chinese unit values			at US unit values			Geometric average
	China	USA	China/ USA (%)	China	USA	China/ USA (%)	China USA (%)
	(in Yuan)			(in US$)			
1/2Food and beverages	3,196	109,634	2.9	2,284	68,121	3.4	3.1
1 Food Manufacturing	3,083	112,714	2.7	1,849	63,717	2.9	2.8
2 Beverages	3,544	88,825	4.0	3,635	97,878	3.7	3.8
3 Tobacco Products	2,393	65,939	3.6	5,879	170,171	3.5	3.5
4 Textile Mill Products	3,025	45,056	6.7	1,906	30,220	6.3	6.5
5 Wearing Apparel	2,297	34,798	6.6	1,568	25,398	6.2	6.4
6 Leather Products and Footwear	2,495	22,446	11.1	2,774	26,617	10.4	10.8
7 Wood Products, Furniture & Fixtures	2,209	58,670	3.8	1,170	33,871	3.5	3.6
8 Paper Products, Printing & Publishing	3,183	107,251	3.0	1,860	54,485	3.4	3.2
9 Chemical Products	6,232	150,673	4.1	4,707	92,694	5.1	4.6
10 Rubber & Plastic Products	3,757	169,277	2.2	4,254	46,315	9.2	4.5
11 Non-metallic Mineral Products	2,459	59,994	4.1	4,422	52,468	8.4	5.9
12 Basic & Fabricated Metal Products	4,747	30,943	15.3	2,780	46,870	5.9	9.5
13 Machinery & Transport Equipment	4,066	162,470	2.5	1,865	57,003	3.3	2.9
14 Electrical Machinery & Equipment	5,147	47,762	10.8	5,994	49,588	12.1	11.4
15 Other Manufacturing Industries	3,068	97,877	3.1	2,441	54,070	4.5	3.8
Total Manufacturing	3,742	97,639	3.8	3,256	53,209	6.1	4.8

Source: Gross value added from table 6, employment from tables 2 and 3.

The comparisons of gross value added per person are presented in table 7. Highest labour productivity is found in electrical machinery and equipment (11.4% of the US level), leather products and footwear (10.8%) and metal products (9.5%). Low relative productivity is found in machinery and transport equipment (2.9%), food manufacturing (2.8%), paper products, printing and publishing (3.2%), tobacco products (3.5%) and wood products (3.6%). For total manufacturing Chinese productivity was 4.8 per cent of the US level.

In annex table A.10. we also made a comparison for gross output per person employed. In this comparison, gross output per person in total manufacturing in China was 8 per cent of that in the USA. Chinese relative productivity in terms of value added was substantially lower than in terms of gross output. This discrepancy is due to the lower share of value added in total output in China compared to the USA. In the following, we will focus on value added comparisons.

Even though the matchings are extremely rough, low relative productivity in Chinese manufacturing is not due to too high PPPs. On the contrary, the PPPs are very low. Application of the exchange rate to Chinese value added per person from the census would result in much lower productivity figures.

One possible explanation for low relative productivity is that the comparison includes small scale establishments. which have very low labour productivity in China. A second explanation may lie in wasteful use of both intermediate inputs and factor inputs in China. With regard to factor inputs of labour Chinese enterprises are often characterised by extensive labour hoarding.

An extremely labour intensive small scale sector exists in many low income countries and it is well known that labour productivity is far below that in medium and large scale manufacturing (see f.i. Szirmai, 1994 for Indonesia and van Ark, 1991 for India). For China, figures in current yuan show that value added per person in medium and large scale manufacturing is 1.64 times as high as value added in the whole of manufacturing (PRC, 1987/88; PRC, 1988 see footnote 3). In the USA labour productivity in medium and large scale manufacturing (defined as excluding establishments with less than 20 employees) is only 1.023 times as high, as that in total manufacturing.[8] Making a rough adjustment for these productivity differentials, we find that gross value added per person in medium and large scale Chinese manufacturing is about 7.6 per cent of the US level.

It must be stressed that adjustment for small scale manufacturing in China is fraught with uncertainties. The English source on large and medium size enterprises (PRC, 1988) gives no definition of medium and large scale enterprises. The *Explanation of Industrial Statistical Indicators* (SSB, 1993a) provides definitions, based either on installed production capacity, fixed capital stock or annual output. But the cut-off points are different for each sector of manufacturing, even when the same indicator is used.

From SSB (1993a) can calculate that the average number of employees per enterprise in the small scale sector is 94, against against 1636 in medium scale manufacturing and 4794 in large scale manufacturing. In terms of employment, this

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[8] This figure is calculated from *1987 Census of Manufacturing, General Summary*. Table 1 from this source provides data on employment, including head office and auxiliary employment and gross value added. Table 4 provides a breakdown of employment (excluding auxiliary employment) and gross value added by employment size class. In calculating the productivity ratios we assume that all head office and auxiliary employment is in establishments with more than 20 persons employed.

would suggest a cut-off point of around hundred persons employed rather than the often used cut-off point of 20 or more persons employed. However the data refer to enterprises, rather than establishments, so a cut-off point of 20 persons employed per establishment would not be totally inconceivable either. If we assume the cut-off point is 100 or more persons employed and apply this to the US data as well, Chinese labour productivity in medium and large scale enterprise would come out at around 7.2%.[9] For the time being, we will assume Chinese labour productivity in medium and large scale manufacturing is between 7.2 and 7.6 per cent of the US level.

The level of labour productivity in Chinese manufacturing is in the same range as levels found in other studies of Asian low income countries. For medium and large scale manufacturing in India Van Ark (1991) estimated gross value added per person in 1985 at 7.7 per cent of the US level.[10] This similarity between India and China is interesting in the light of the often highly favourable comparisons of Chinese economic performance with that of India (e.g. Malenbaum, 1982). Labour productivity in Indonesian medium and large scale manufacturing (excluding establishments with less than 20 employees) in 1985 was 10.5% of the US level, which is substantially higher than both China and India (Szirmai, 1994).

6 Estimates of Economic Growth in China

6.1 Introduction

Recent literature on Chinese growth performance suggests that official statistics tend to overestimate the rate of economic growth (World Bank, 1992; Keidel, 1992; Perkins, 1988). Alternative empirical estimates are scarce. Two Chinese studies from 1989 confirm that present methods for calculating growth rates produce upwardly biased estimates (Industry Division, Statistics Bureau of Hunan Provincce, 1989; Industry division, Statistics Bureau of Jiang Xi Province, 1989).

Reasons for the overestimation of growth rates include:

1. The lack of indices of production based on samples of products. Indices of production are based on total coverage of output, supposedly at constant administrative prices (SSB, 1987a). In practice, it turns out that there is often little difference between the constant price and the current price indices of production. Many new products produced by township and village enterprises do not have any constant prices. They are valued at current prices. The same occurs with new products sold by state enterprises. Overall, the major shortcomings of China's price indices are the irregularities introduced by weights which overemphasize commodities and items covered by list prices and underemphasize prices in transactions using negotiated and periodic market prices (World Bank, 1992).
2. The lack of independently constructed price deflators, which adequately reflect price increases. Price indices customarily underestimate deflation. Most price indices

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[9] Value added per worker in establishments with 100 or more workers employed in the USA is 1.076 times value added per worker in total manufacturing (Source: *1987 Census of Manufactures, General Summary*, Table 1: total employment, including auxiliary employment and gross value added, table 4, employment and value added in establishments with less than 100 persons employed).

[10] This figure is an update of a benchmark comparison for 1975. Indian medium and large scale manufacturing is defined as excluding all establishments with less than 10 employees and establishments with 10-19 employees which "do not use power" see van Ark, 1991, p. 15.

are implicit deflators derived from comparing indices of production at constant administrative prices and current prices (see point 1).
3. The practice of not writing off unsalable inventories.

Indices of industrial production tend to overestimate growth for the same kind of reasons as indices of total GDP. Official estimates of Chinese growth rates of industrial production at constant prices are based on gross product at constant prices, rather than on current gross output deflated by a price index (see Pan and Xu, 1989; Fu and Lie, 1989). Three categories of products can be distinguished in this context: a. products which fall under ministerial departments; b. products which fall under local government; c. products for which information is supplied by firms to higher government agents.

The government provides 1980 ex factory prices for products falling under central government. Local government supplies 1980 ex factory prices for products falling under local government. For the remaining products use is made of 1980 ex factory prices of the enterprises themselves. For each category base year prices are applied to output quantities with 100 per cent coverage. There are five base years: 1952, 1957, 1970, 1980 and 1990. Growth rates are calculated for the subperiods and then linked (see SSB, 1987a, 1993a).

In this section, we will present fresh statistical material on growth rates of value added in industry (including mining, logging, utilities and manufacturing) and manufacturing proper from 1980 to 1992. We will use a new industrial producer price index, published for the first time in 1993, applying this to the time series of gross value of output and net value added at current prices to get new estimates of growth of industrial output at constant prices.

6.2 Growth of Gross Value of Output and Net Value Added in Manufacturing in China, 1980-92

Table 8 presents our time series for China on gross value of output and net value added by branch of manufacturing from 1980 to 1992. No time series are available for gross value added. The data in current prices derive from the *1993 Industrial Economy Statistics Yearbook* (see Annex table A.1). From 1987 onwards Chinese national income statistics are calculated on a SNA basis. We assume this also holds for the data in the 1993 industrial statistics yearbook. In any event, the differences between material product concepts and SNA are smaller for manufacturing, where most of the output is physical.

One of the criticisms of official estimates of Chinese growth rates is that there are no good deflators (see section 6.1 above). The deflators used do not take price increases into account adequately. Often current price and constant price estimates are identical. The 1993 edition of the *China Statistical Yearbook* (SSB, 1993b) presents producer prices indices for fourteen industrial sectors for the first time (see Annex table A.2). These price indices refer to changes relative to the previous year. We have linked these indices to derive price indices for the period 1980-1992 (see Annex table A.3). These have been applied to the current price gross output and net value added figures in annex table A.1 to calculate the constant price figures in table 8. The data

have been recategorised into 15 branches of manufacturing commonly distinguished in other studies of the ICOP project (More detail is shown in annex table A.1).

The compound growth rate of gross value of output in total manufacturing from 1980 to 1992 was 9.6 per cent per annum. The growth rate of net value added was 7.6 per cent per annum. The growth rates for total industry (including mining, manufacturing, logging and utilities) were about the same as for manufacturing (9.5% per annum for gross output and 7.4% per annum for net value added). It is interesting to note that the share of net value added in the gross value of output declined sharply over these twelve years from 34 to 27 per cent in industry and 31 to 25 per cent in manufacturing.[11] Possible explanations for this trend include: 1. increasing specialisation and division of labour; 2. increasing inefficiency in the use of intermediate inputs; 3. changes in pricing conventions and statistical concepts.

The highest growth rates of value added were registered in beverages (12.4%), tobacco processing (11%), wearing apparel (10.3%) and electrical machinery and equipment (10.2%). Lowest growth rates were found in basic and fabricated metals (5.5%), textiles (4.2%), oil refining (3%) and wood products (1.6%).

[11] The same trend appears if one looks at the figures in current values.

TABLE 8
Gross Value of Output and Net Value Added at Constant 1980 prices, by Branch of Manufacturing, China, 1980-1992
(100,000,000; in constant 1980 yuan)

ICOP BRANCH	Category of Industry		1980	1984	1985	1986	1987	1988	1989	1990	1991	1992	Compound growth rate
	Total Industry	a. GVO	4,702.5	6,731.0	7,660.2	8,256.1	9,177.9	10,284.9	10,388.6	10,673.5	11,878.5	13,959.8	9.5
		b. NVA	1,598.3	2,206.5	2,485.3	2,606.1	2,828.1	3,032.9	2,915.2	2,908.8	3,180.9	3,749.7	7.4
		b as % a	0.34	0.33	0.32	0.32	0.31	0.29	0.28	0.27	0.27	0.27	
1/2	Food and beverages	a. GVO	463.04	635.34	708.07	777.54	849.06	963.75	980.01	1033.18	1177.65	1295.09	8.9
		b. NVA	80.35	113.94	130.25	145.48	161.60	186.12	181.17	192.27	237.05	247.94	9.8
		b as % a	0.17	0.18	0.18	0.19	0.19	0.19	0.18	0.19	0.20	0.19	
1	Food manufacturing industry	a. GVO	395.77	523.9	576.7	633.9	670.3	757.7	775.0	809.0	917.0	993.4	8.0
		b. NVA	56.18	76.0	86.5	100.2	107.8	119.6	120.0	125.0	151.1	150.0	8.5
		b as % a	0.14	0.15	0.15	0.16	0.16	0.16	0.15	0.15	0.16	0.15	
2	Beverage manufacturing industry (a)	a. GVO	67.27	111.5	131.4	143.6	178.7	206.1	205.0	224.2	260.7	301.7	13.3
		b. NVA	24.17	37.9	43.7	45.3	53.8	66.5	61.2	67.2	85.9	98.0	12.4
		b as % a	0.36	0.34	0.33	0.32	0.30	0.32	0.30	0.30	0.33	0.32	
3	Tobacco processing (a) industry	a. GVO	86.03	152.5	177.3	192.0	216.6	247.4	265.2	298.1	308.6	343.2	12.2
		b. NVA	53.31	95.3	102.4	119.9	133.5	149.4	153.4	173.2	178.3	186.8	11.0
		b as % a	0.62	0.62	0.58	0.62	0.62	0.60	0.58	0.58	0.58	0.54	
4	Textile industry	a. GVO	699.1	1,014.2	1,156.6	1,241.3	1,353.3	1,392.2	1,388.5	1,406.7	1,494.1	1,722.0	7.8
		b. NVA	199.8	231.1	274.2	303.1	317.1	328.2	314.3	302.5	296.5	325.5	4.2
		b as % a	0.29	0.23	0.24	0.24	0.23	0.24	0.23	0.22	0.20	0.19	
5	Wearing apparel	a. GVO	107.1	153.6	177.2	192.8	214.1	231.6	240.2	258.9	299.6	387.3	11.3
		b. NVA	25.8	41.0	50.5	54.4	57.7	59.6	61.8	63.0	70.1	83.6	10.3
		b as % a	0.24	0.27	0.29	0.28	0.27	0.26	0.26	0.24	0.23	0.22	
6	Leather, fur and manufactured products industry	a. GVO	50.1	59.7	73.0	85.5	99.5	109.0	107.5	114.9	134.1	152.5	9.7
		b. NVA	13.4	15.5	19.2	22.2	25.1	24.7	23.7	26.1	29.4	29.4	6.8
		b as % a	0.27	0.26	0.26	0.26	0.25	0.23	0.22	0.23	0.22	0.19	
7	Wood products and furniture (b)	a. GVO	53.5	70.5	74.3	76.7	65.6	68.2	62.8	64.9	74.4	89.7	4.4
		b. NVA	17.3	21.7	22.4	22.7	18.6	18.4	16.7	16.1	18.3	21.1	1.6
		b as % a	0.32	0.31	0.30	0.30	0.28	0.27	0.27	0.25	0.25	0.23	
8	Paper, paper products and printing industry (c)	a. GVO	135.1	186.3	205.7	221.4	248.7	271.2	260.7	270.1	298.8	343.4	8.1
		b. NVA	42.2	55.9	62.8	66.3	71.1	75.3	68.2	68.6	73.8	85.0	6.0
		b as % a	0.31	0.30	0.31	0.30	0.29	0.28	0.26	0.25	0.25	0.25	
9	Oil refining, coal, coking and coal products (d)	a. GVO	184.1	210.2	220.9	244.2	268.2	293.5	320.3	333.7	391.6	422.0	7.2
		b. NVA	70.98	83.1	86.7	95.2	98.2	99.4	87.9	81.4	88.7	101.6	3.0
		b as % a	0.39	0.40	0.39	0.39	0.37	0.34	0.27	0.24	0.23	0.24	
9	Chemical industry, excluding oil refining (e)	a. GVO	458.5	699.0	748.7	841.9	971.8	1,084.4	1,129.9	1,220.6	1,351.3	1,560.7	10.7
		b. NVA	142.9	212.1	222.1	249.9	277.1	309.6	300.4	325.7	362.1	433.4	9.7
		b as % a	0.31	0.30	0.30	0.30	0.29	0.29	0.27	0.27	0.27	0.28	
9	Chemical industry, total	a. GVO	642.64	909.25	969.70	1,086.14	1,239.95	1,377.93	1,450.23	1,554.22	1,742.86	1,982.78	9.8
		b. NVA	213.84	295.23	308.80	345.12	375.25	408.95	388.33	407.05	450.72	534.98	7.9
		b as % a	0.33	0.32	0.32	0.32	0.30	0.30	0.27	0.26	0.26	0.27	

TABLE 8 (continued)
Gross Value of Output and Net Value Added at Constant 1980 Prices, by Branch of Manufacturing, China, 1980-1992
(100,000,000; in constant 1980 yuan)

ICOP BRANCH	Category of Industry		1980	1984	1985	1986	1987	1988	1989	1990	1991	1992	Compound growth rate
10	Rubber and plastic products industry (f)	a. GVO	154.6	227.8	253.7	271.4	303.2	374.9	363.7	362.5	406.8	477.0	9.8
		b. NVA	51.5	69.9	76.9	77.9	81.8	91.3	89.5	91.2	100.1	115.9	7.0
		b as % a	0.33	0.31	0.30	0.29	0.27	0.24	0.25	0.25	0.25	0.24	
11	Building materials and other non-metallic minerals	a. GVO	201.0	299.2	336.8	362.2	393.6	440.5	422.2	423.3	472.8	573.5	9.1
		b. NVA	80.5	114.8	129.4	138.2	141.3	152.2	134.5	130.4	151.8	198.2	7.8
		b as % a	0.40	0.38	0.38	0.38	0.36	0.35	0.32	0.31	0.32	0.35	
12	Basic and fabricated metals (g) (h)	a. GVO	564.2	701.0	787.2	879.6	971.9	1,034.3	1,062.0	1,065.7	1,091.9	1,258.7	6.9
		b. NVA	168.9	213.6	233.2	249.6	273.6	287.9	285.1	253.0	256.7	320.4	5.5
		b as % a	0.30	0.30	0.30	0.28	0.28	0.28	0.27	0.24	0.24	0.25	
13	Machinery and transport equipment (i)	a. GVO	639.7	1,001.3	1,197.0	1,206.3	1,399.9	1,606.7	1,492.6	1,446.6	1,750.9	2,330.4	11.4
		b. NVA	222.3	331.1	401.9	389.4	428.5	475.2	432.2	406.6	477.3	620.9	8.9
		b as % a	0.35	0.33	0.34	0.32	0.31	0.30	0.29	0.28	0.27	0.27	
14	Electrical machinery and apparatus manufacturing (j)	a. GVO	228.4	414.9	544.2	567.3	664.8	820.2	832.9	788.9	904.4	1,089.9	13.9
		b. NVA	77.6	134.8	171.2	164.7	181.0	213.6	217.3	203.4	227.2	248.5	10.2
		b as % a	0.34	0.32	0.31	0.29	0.27	0.26	0.26	0.26	0.25	0.23	
15	Other industry (k) (l)	a. GVO	109.7	151.2	203.2	232.8	235.5	262.0	272.1	276.7	316.0	392.3	11.2
		b. NVA	44.44	58.3	71.0	81.8	80.9	85.4	87.0	84.4	95.6	106.1	7.5
		b as % a	0.41	0.39	0.35	0.35	0.34	0.33	0.32	0.31	0.30	0.27	
	Total manufacturing	a. GVO	4,134.0	5,976.9	6,864.0	7,392.9	8,255.8	9,199.9	9,200.6	9,364.6	10,473.0	12,437.8	9.6
		b. NVA	1,291.2	1,792.4	2,054.0	2,180.9	2,347.0	2,556.2	2,453.1	2,417.7	2,662.9	3,124.2	7.6
		b as % a	0.31	0.30	0.30	0.29	0.28	0.28	0.27	0.26	0.25	0.25	

Source: Gross value of output and net value added from Annex table A.1; deflators from Annex table A.3.

Notes: (a) We used the price deflator for food products
(b) We used the price deflator for wood products, which we assume includes both logging and wood products proper.
(c) We used the price deflator for paper products
(d) We used the deflator for the oil industry, which, we assume, includes both crude oil production and oil refining.
(e) including medical industry and chemical fibres industry
(f) No separate index for rubber and plastics. We used the overall price index for industry.
(g) combining ferrous and non ferrous metals and fabricated metal products
(h) We used the index for the metallurgical industry, which probably refers to metal mining. This index shows very rapid price increases. Thus the series may understate growth.
(i) We used the price deflator for machinery.
(j) including electronic and communication equipment. There was no separate deflator for this branch. We used the overall price index for industry as a deflator.
(k) We combined cultural products, arts and crafts, measurement instruments and other into the ICOP category other.
(l) We used the price deflator for cultural products for cultural products, arts and crafts and the overall price deflator for instruments and other.

6.3 Other Estimates of Chinese Economic Growth in Industry

The most recent official source which presents growth rates of output at constant prices for detailed branches of industry is the 1988 edition of the *Industrial Economy Statistics Yearbook*. This source presents time series of gross value of output (material product concept, prior to introduction of SNA concepts) in industry from 1952 to 1987 for 15 branches of industry. Industry is a wider concept than manufacturing, including mining, utilities and logging. We assume that mining is included in the metallurgical industry, the coal industry and the petroleum industry and logging in forestry.

Very high growth rates were registered between 1952 and 1957. Growth was lowest between 1957 and 1978, picking up somewhat in the 1980's. The average annual growth rate of industrial output over the whole period 1952-1987 was 11 per cent per annum.

If we compare the annual growth rates for the period 1980-87 in table 9 with growth rates calculated for the same period from our own estimates in table 8, we find that our growth rate for gross value of output in industry is a full percentage point lower than that in table 9. For all sectors for which comparisons are possible (food, textiles, wearing apparel, leather, paper, petroleum, chemicals, building materials and machinery), the growth rates calculated from our table 8 are lower than those in table 9. The single exception is wearing apparel. In most sectors the compound growth rate of net value added from table 8 is well below that of gross output. For instance, between 1980 and 1987 net value added in total industry increased by 8.5 per cent per annum, while gross value of output increased by 10 per cent per annum. Thus net value added figures give a more modest picture of growth than gross output figures.

In summary, both sources show rapid industrial growth in the 1980's, but our estimates of growth tend to be lower than growth rates calculated from older official sources.

TABLE 9
Gross Value of Output by Industrial Branch, 1952-1987 (1980=100) (a)
(in constant 1980 prices)

Year	Total Industry (b)	Metallurgical Industry	Power Industry	Coal Industry	Petroleum Industry	Chemical Industry	Machine Building Industry	Building Materials Industry	Forestry indutry	Food manufacturing	Textile Industry	Wearing Apparel (c)	Leather Industry (c)	Paper Industry (c)	Culture, Educational and Crafts (c)	Other Industry (c)
1952	5.3	3.8	2.5	10.7	0.7	1.1	1.8	4.7	28.9	17.1	12.8	8.2	10.8	11.4	3.6	3.8
1953	6.9	5.2	2.9	11.8	0.8	1.5	2.9	6.5	39.5	21.4	15.7	11.5	12.9	13.1	5.6	
1954	8.0	6.3	3.5	14.3	1.1	1.9	3.4	7.2	46.6	24.5	17.2	11.9	13.1	14.9	6.5	
1955	8.5	7.9	4.0	16.8	1.7	2.1	3.8	7.3	42.1	26.9	16.6	11.9	12.9	16.7	7.3	
1956	10.9	11.1	5.3	19.6	2.4	3.1	5.9	10.3	51.9	29.1	20.0	16.6	16.5	21.5	9.3	
1957	12.1	13.6	6.2	23.6	2.7	4.3	6.8	11.7	55.0	31.8	19.4	16.5	20.0	27.2	9.1	12.9
1958	18.8	25.0	8.5	46.5	4.2	7.5	13.9	21.0	66.2	38.9	27.0	19.6	26.7	36.4	12.1	
1959	25.5	36.5	13.9	64.3	6.5	10.7	20.5	35.3	77.4	44.1	34.2	30.7	38.6	50.9	17.1	22.3
1960	28.4	46.6	20.1	72.4	8.1	12.8	28.1	40.0	81.9	39.6	27.4	18.7	41.1	53.9	20.8	
1961	17.5	25.9	16.5	49.8	6.3	9.2	13.5	15.9	49.1	32.5	18.4	18.0	26.9	31.8	14.1	
1962	14.6	19.4	15.9	37.9	7.5	8.4	9.8	9.3	42.8	29.1	16.5	17.2	20.2	30.7	12.2	22.1
1963	15.9	21.6	17.1	37.7	8.2	9.7	10.8	11.9	45.5	30.2	18.9	16.5	18.4	35.0	13.4	
1964	19.0	26.8	19.3	35.1	11.4	12.3	13.0	16.0	51.1	35.1	23.8	18.3	18.9	38.8	14.4	
1965	24.0	33.9	22.9	38.6	15.4	16.0	17.7	20.4	54.1	40.3	29.8	19.9	20.7	43.3	17.7	36.5
1966	29.0	41.1	28.2	41.8	21.2	22.6	23.9	27.8	55.6	36.7	32.4			44.1		
1967	25.0	30.2	26.0	30.6	18.5	19.8	17.8	22.1	47.4	36.0	29.6			40.6		
1968	23.7	24.3	25.0	33.1	21.2	17.3	15.5	18.5	38.0	36.0	27.7			35.3		
1969	31.9	37.7	34.0	41.3	23.6	26.6	24.7	26.3	46.1	37.6	35.5			45.9		
1970	41.6	51.8	39.6	58.0	36.0	35.7	36.9	32.0	49.2	45.4	43.8	40.3	41.8	50.9	35.9	73.9
1971	47.9	61.8	47.0	66.7	43.6	41.8	47.5	36.8	52.6	50.1	42.3	39.8	41.3	50.2	35.5	73.0
1972	51.0	65.1	51.6	69.0	49.6	46.1	50.1	42.8	59.5	55.7	42.6	40.3	41.8	53.7	36.0	74.0
1973	55.9	69.8	56.3	69.0	54.6	51.1	55.7	46.1	64.6	61.4	47.5	44.5	39.9	59.8	43.4	74.8
1974	56.0	61.1	56.9	66.5	62.2	49.5	58.4	45.8	66.0	63.1	47.0	47.0	42.0	56.3	47.3	69.4
1975	64.5	67.0	66.2	78.7	71.3	58.6	69.9	55.1	70.5	68.0	53.8	54.1	48.9	64.6	54.1	77.6
1976	65.3	61.7	68.7	79.2	79.8	57.9	70.5	60.5	75.8	68.4	53.6	58.3	52.8	64.7	56.1	84.4
1977	74.7	67.5	75.1	89.9	89.9	68.1	81.4	73.4	80.7	76.7	62.6	65.9	61.3	74.1	63.5	94.5

TABLE 9 (continued)
Gross Value of Output by Industrial Branch, 1952-1987 (1980=100) (a)
(in constant 1980 prices)

Year	Total Industry (b)	Metallurgical Industry	Power Industry	Coal Industry	Petroleum Industry	Chemical Industry	Machine Building Industry	Building Materials Industry	Forestry indutry	Food manufacturing	Textile Industry	Wearing Apparel (c)	Leather Industry (c)	Paper Industry (c)	Culture, Educational and Crafts (c)	Other Industry (c)
1978	84.8	85.7	85.7	102.2	92.5	84.4	90.7	84.8	89.3	83.0	71.9	67.4	66.6	83.9	74.1	98.9
1979	92.0	95.4	93.8	103.4	98.9	90.3	97.7	92.2	97.8	91.3	80.6	75.0	74.3	94.1	86.1	95.1
1980	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1981	104.1	96.5	103.0	98.5	97.3	104.7	96.3	99.7	99.4	112.7	118.0	113.9	113.6	99.8	108.4	102.4
1982	112.2	102.6	109.5	104.1	99.3	116.6	109.2	113.7	106.4	123.4	119.5	109.8	107.9	106.5	115.1	112.2
1983	124.0	110.7	116.4	111.6	106.9	131.2	128.4	125.4	110.0	129.7	131.8	118.8	110.5	117.1	119.3	126.5
1984	141.4	122.5	124.5	121.9	115.2	146.9	156.6	146.8	120.2	141.4	149.3	138.3	120.5	132.6	135.2	149.1
1985	166.8	140.4	144.2	130.5	128.5	164.0	199.3	179.1	126.2	155.4	175.5	154.2	148.2	154.9	189.7	184.0
1986	180.6	158.5	154.5	134.9	139.7	184.0	211.5	208.5	135.3	168.6	186.3	162.0	173.6	173.1	202.2	191.8
1987	207.3	173.8	170.6	140.7	149.9	215.4	257.4	234.8	149.3	187.5	208.6	187.9	202.2	198.8	246.5	213.0
	Average Annual Growth Rates of Gross Value of Output at Constant 1980 Prices, 1952-1987															
52-87	11.0	11.6	12.9	7.6	16.7	16.3	15.1	11.8	4.8	7.1	8.3	9.3	8.7	8.5	12.8	12.2
52-57	18.0	29.2	20.4	17.2	32.7	31.2	29.7	20.0	13.7	13.2	8.6	14.9	13.1	19.1	20.0	27.7
57-70	10.0	10.8	15.3	7.2	21.9	17.7	13.9	8.0	-0.9	2.8	6.5	7.1	5.8	4.9	11.2	14.4
70-78	9.3	6.5	10.1	7.3	12.5	11.4	11.9	13.0	7.7	7.8	6.4	6.7	6.0	6.5	9.5	3.7
78-87	10.4	8.2	8.0	3.6	5.5	11.0	12.3	12.0	5.9	9.5	12.6	12.1	13.1	10.1	14.3	8.9
80-87	11.0	8.2	7.9	5.0	6.0	11.6	14.5	13.0	5.9	9.4	11.1	9.4	10.6	10.3	13.8	11.4

Source: SSB, *1988 Industrial Economy Statistics Yearbook*, pp. 54/55

Notes: (a) Gross material product
(b) including mining, utilities and logging, excluding construction.
(c) For Wearing Apparel, Leather, Paper, Culture and Other data for 1970 and 1971 needed for calculation of growth rates are lacking. For 'Other' the data for 195 missing. The data for these years have been calculated by interpolation using the movement for total industry after deduction of the branches for which data are available.

Wu's Estimates of Growth of Chinese GDP, 1952-1990

Wu (1993) attempts to bridge the gap between the SNA concept of GDP and the MPS concept of Net Material Product in an ingenious fashion. The main differences between these two concepts consist of the exclusion of so-called nonmaterial services from net material product and the treatment of depreciation as an intermediate input in the MPS system. For the period 1978-1990 the *1991 China Statistical Yearbook* presents both GDP and NMP figures. On the basis of these figures Wu calculates regression equations, relating GDP to NMP in agriculture, industry and services. He uses these regression equations to transform NMP data into GDP estimates for the period 1952-1978. His results for the total economy and the industrial sector are summarised in table 10.

Wu's estimates take the conceptual differences between MPS and SNA into account very effectively and form an important step forward in estimating long-term series of Chinese GDP. However, they do remain based on official GDP figures. This means that the problems of undercoverage, distorted price weights and inadequate deflators discussed in World Bank (1992) and Keidel (1992) still need to be addressed. Linking the Chinese time series, so as to put the whole series on a 1980 basis, does not mean that the deficiencies of the constant price series based on 1952, 1957 and 1970 prices have been overcome. The constant price series of real output are still based on the original price weights, even though they have been linked.

Maddison (1995) uses Wu's data for agriculture and industry. For the service sector, he assumes that half of services move parallel to the joint product of agriculture and industry and half move parallel to population. For aggregate GDP this results in lower growth rates than Wu's procedures (5.3% compound growth rate from 1952 to 1990, against a compound growth rate of Wu of 6%).

TABLE 10:
Chinese GDP at 1980 prices, 1952-1990 (Wu's estimate)
(billion yuan)

Year	Total GDP (a)	Total GDP (1980=100)	GDP Industry (b)	GDP Industry (1980=100)
1952	113.8	25.9	12.7	5.9
1953	126.4	28.7	17.0	7.9
1954	131.7	29.9	19.6	9.1
1955	140.1	31.8	21.1	9.8
1956	154.3	35.1	28.5	13.2
1957	160.0	36.4	30.8	14.3
1958	183.2	41.6	47.8	22.1
1959	187.1	42.5	60.7	28.1
1960	177.8	40.4	65.0	30.1
1961	135.9	30.9	36.2	16.8
1962	130.1	29.6	31.7	14.7
1963	143.4	32.6	36.0	16.7
1964	164.2	37.3	44.9	20.8
1965	187.9	42.7	56.2	26.0
1966	215.3	48.9	69.5	32.2
1967	205.9	46.8	59.3	27.4
1968	194.9	44.3	53.3	24.7
1969	222.4	50.5	72.2	33.4
1970	260.5	59.2	98.0	45.3
1971	276.7	62.9	110.8	51.3
1972	283.9	64.5	117.1	54.2
1973	307.8	69.9	126.4	58.5
1974	311.0	70.7	126.4	58.5
1975	334.0	75.9	144.8	67.0
1976	325.1	73.9	140.4	65.0
1977	349.6	79.4	159.4	73.8
1978	393.3	89.4	184.2	85.2
1979	420.5	95.5	198.1	91.7
1980	440.1	100.0	216.1	100.0
1981	467.3	106.2	219.7	101.7
1982	505.1	114.8	232.5	107.6
1983	558.5	126.9	256.9	118.9
1984	634.5	144.2	293.7	135.9
1985	729.2	165.7	351.8	162.8
1986	788.1	179.1	387.9	179.5
1987	873.7	198.5	438.1	202.7
1988	973.8	221.3	509.2	235.6
1989	1,002.7	227.8	532.7	246.5
1990	1,037.3	235.7	559.3	258.8
Growth rate 1952-90	6.0		10.5	
Growth rate 1952-87	6.0		10.6	
Growth rate 1952-57	7.1		19.4	
Growth rate 1957-70	3.8		9.3	
Growth rate 1970-78	5.3		8.2	
Growth rate 1978-87	9.3		10.1	
Growth rate 1980-87	10.3		10.6	
Growth rate 1980-90	9.0		10.0	

Source: WU (1993), table 3, p 72. Wu's estimates calculated from *1991 China Statistical Yearbook*, p. 31.

Notes: (a) SNA concept
(b) including mining and construction

6.4 Growth Estimates Compared

Table 11 compares the growth rates from tables 8, 9 and 10.

TABLE 11
Compound Growth Rates in Industry and Manufacturing, 1952-1990 (a)

1952-87:	Yearbook (gvo in industry)	11.0
	Wu (gdp in industry)	10.6
1952-57:	Yearbook (gvo in industry)	18.0
	Wu (gdp in industry)	19.4
1957-70:	Yearbook (gvo in industry)	10.0
	Wu (gdp in industry)	9.3
1970-78:	Yearbook (gvo in industry)	9.3
	Wu (gdp in industry)	8.2
1978-87:	Yearbook (gvo in industry)	10.4
	Wu (gdp in industry)	10.1
1980-87:	Yearbook (gvo in industry)	11.0
	Wu (gdp in industry)	10.6
	Szirmai/Ren (gvo in industry)	10.0
	Szirmai/Ren (nva in industry)	8.5
	Szirmai/Ren (gvo in manufacturing)	10.4
	Szirmai/Ren (nva in manufacturing)	8.9
1980-90:	Wu (gdp in industry)	10.0
	Szirmai/Ren (gvo in industry)	8.5
	Szirmai/Ren (nva in industry)	6.2
	Szirmai/Ren (gvo in manufacturing)	8.5
	Szirmai/Ren (nva in manufacturing)	6.5

Sources: Szirmai/Ren from table 8; Yearbook from table 9, Wu from table 10.

Note (a): Wu and Yearbook refer to growth rates for industry, Szirmai and Ren refer to both industry and manufacturing.

Considering that Wu's estimates are based on official published data, it is not surprising that the growth rates for industry in table 10 are very similar for all subperiods to those calculated from the *1988 Industrial Economy Statistics Yearbook* in table 9. Wu's average growth rate for the whole period 1952-1987 is 10.6 per cent per annum, against the 11 per cent calculated from the yearbook. Both tables register the highest growth in the 1952-57 period.[12] Wu's growth rate for this period is higher than the yearbook estimate. For other periods Wu's growth rates are somewhat lower.

Our growth rates in table 8 tend to be substantially lower than those calculated from older official figures. Table 11 shows that our growth rate for net value added in industry between 1980 and 1990 is 6.2 per cent per annum, against the 10 per cent growth rate of gross domestic product calculated from Wu.

Our growth rate for gross value of output in industry between 1980 and 1987 is 10 per cent per annum, against 11 per cent calculated from SSB, *Industrial Economy Statistics Yearbook 1988*. Finally, our growth rate for net value added in industry between 1980 and 1987 is 8.5 per cent, against Wu's growth rate of 10.6 per cent for GDP. These rough comparisons offer support for the conclusion that the use of

[12] Total industry in table 9 excludes construction, which is included in Wu's industrial sector.

independently calculated deflators leads to downward adjustments of growth rates for the important industrial sector of the economy.[13]

6.5 Net Value Added per Person Employed in Chinese Manufacturing 1980-1992

Table 12 presents our time series for Chinese net value added per person employed from 1980 to 1992. We have combined our time series on net value added at constant prices from table 8 with series on labour input from Annex table A.4.

From 1980 to 1992 average labour productivity in manufacturing increased by 3.4 per cent per annum and by 3.3 per cent in total industry (including mining, logging and utilities). Productivity performance varied substantially from branch to branch. Our figures suggest that labour productivity was declining in oil refining (-4%), textiles (-1.5%) and wood products (-0.8%). High productivity growth was registered in the machinery and transport equipment branch (6.6%), electrical machinery and equipment (5.6%), wearing apparel (4.9%) and chemical products, excluding oil refining (4.6%).

The corresponding tables with time series on gross value added, employment and value added per person for US manufacturing can be found in the statistical annex (tables A.6, A.7 and A.8). (For a discussion of the US time series the reader is referred to van Ark and Pilat, 1994).

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[13] A valuable next step would be to calculate deflators for inputs.

TABLE 12
Net Value Added per Person Employed by Branch of Manufacturing, 1980-1992
(in constant 1980 yuan)

ICOP BRANCH	Category of Industry	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Compound growth rate
	Total Industry	3,178.5	3,275.3	3,375.1	3,477.8	3,583.7	3,763.1	3,818.7	3,875.1	4,034.2	3,863.2	3,795.7	3,993.5	4,682.4	
		100	103.0	106.2	109.4	112.7	118.4	120.1	121.9	126.9	121.5	119.4	125.6	147.3	3.3%
1/2	Food and Beverages	2,976.3	2,982.9	2,989.5	2,996.1	3,002.7	3,087.4	3,221.7	3,361.8	3,760.8	3,703.7	3,877.5	4,641.8	4,821.7	
		100	100.2	100.4	100.7	100.9	103.7	108.2	113.0	126.4	124.4	130.3	156.0	162.0	4.1%
1	Food manufacturing industry	2,586.9	2,584.2	2,581.6	2,578.9	2,576.2	2,701.6	2,855.4	3,018.0	3,281.2	3,308.7	3,396.9	4,008.1	3,971.0	
		100	99.9	99.8	99.7	99.6	104.4	110.4	116.7	126.8	127.9	131.3	154.9	153.5	3.6%
2	Beverage manufacturing industry (a)	4,577.7	4,556.7	4,535.9	4,515.1	4,494.5	4,302.3	4,329.4	4,356.8	5,102.8	4,835.8	5,262.0	6,430.2	7,173.5	
		100	99.5	99.1	98.6	98.2	94.0	94.6	95.2	111.5	105.6	115.0	140.5	156.7	3.8%
3	Tobacco processing industry	39,576.8	40,526.8	41,499.6	42,495.7	43,515.7	42,332.1	45,995.0	49,974.9	52,548.0	52,186.2	58,504.8	57,435.3	58,379.7	
		100	102.4	104.9	107.4	110.0	107.0	116.2	126.3	132.8	131.9	147.8	145.1	147.5	3.3%
4	Textile industry	4,195.8	4,014.5	3,841.1	3,675.2	3,516.4	3,802.0	3,759.7	3,717.9	3,661.1	3,440.5	3,257.7	3,094.2	3,482.1	
		100	95.7	91.5	87.6	83.8	90.6	89.6	88.6	87.3	82.0	77.6	73.7	83.0	-1.5%
5	Wearing apparel	1,907.1	1,974.0	2,043.2	2,114.9	2,189.1	2,438.3	2,542.7	2,651.5	2,751.0	2,846.7	2,765.0	2,887.3	3,388.0	
		100	103.5	107.1	110.9	114.8	127.9	133.3	139.0	144.3	149.3	145.0	151.4	177.7	4.9%
6	Leather, fur and manufactured products	2,229.3	2,175.6	2,123.2	2,072.0	2,022.1	2,224.1	2,390.5	2,569.3	2,508.4	2,430.8	2,550.8	2,666.1	2,609.6	
		100	97.6	95.2	92.9	90.7	99.8	107.2	115.3	112.5	109.0	114.4	119.6	117.1	1.3%
7	Wood products and furniture	1,550.9	1,542.2	1,533.6	1,524.9	1,516.4	1,486.3	1,338.4	1,205.3	1,206.6	1,105.3	1,051.9	1,191.6	1,408.7	
		100	99.4	98.9	98.3	97.8	95.8	86.3	77.7	77.8	71.3	67.8	76.8	90.8	-0.8%
8	Paper, paper products and printing industry	2,526.3	2,579.0	2,632.8	2,687.7	2,743.8	2,858.1	2,852.0	2,845.8	2,910.5	2,637.0	2,595.8	2,684.0	3,028.8	
		100	102.1	104.2	106.4	108.6	113.1	112.9	112.6	115.2	104.4	102.8	106.2	119.9	1.5%
9a	Oil refining, coal, coking and coal products	19,860.1	19,697.3	19,535.9	19,375.8	19,216.9	18,971.6	18,071.9	17,214.9	15,960.9	13,196.2	11,741.6	11,121.2	12,107.0	
		100	99.2	98.4	97.6	96.8	95.5	91.0	86.7	80.4	66.4	59.1	56.0	61.0	-4.0%
9b	Chemical industry, excluding oil refining	4,191.2	4,418.8	4,658.9	4,912.0	5,178.8	5,186.3	5,451.2	5,729.6	5,995.0	5,655.1	5,845.9	6,171.3	7,172.4	
		100	105.4	111.2	117.2	123.6	123.7	130.1	136.7	143.0	134.9	139.5	147.2	171.1	4.6%
9	Chemical industry, Total	5,678.2	5,877.8	6,084.3	6,298.2	6,519.6	6,514.8	6,724.6	6,941.2	7,067.3	6,495.5	6,498.0	6,763.5	7,774.2	
		100	103.5	107.2	110.9	114.8	114.7	118.4	122.2	124.5	114.4	114.4	119.1	136.9	2.7%
10	Rubber and plastic products industry	3,814.9	3,844.3	3,874.1	3,904.0	3,934.2	3,964.9	3,878.9	3,794.9	4,036.7	3,958.7	3,912.5	4,060.2	4,619.6	
		100	100.8	101.6	102.3	103.1	103.9	101.7	99.5	105.8	103.8	102.6	106.4	121.1	1.6%
11	Building materials and other non-metallic minerals	1,765.8	1,804.0	1,842.9	1,882.7	1,923.4	1,947.7	1,929.6	1,911.6	2,025.5	1,861.0	1,866.1	2,114.2	2,755.3	
		100	102.2	104.4	106.6	108.9	110.3	109.3	108.3	114.7	105.4	105.7	119.7	156.0	3.8%
12	Basic and fabricated metals	3,391.7	3,480.4	3,571.3	3,664.7	3,760.4	3,887.9	4,008.6	4,133.0	4,203.5	4,104.2	3,599.2	3,592.6	4,367.2	
		100	102.6	105.3	108.0	110.9	114.6	118.2	121.9	123.9	121.0	106.1	105.9	128.8	2.1%
13	Machine industry and Transportation equipment	2,167.1	2,334.3	2,514.2	2,708.1	2,917.0	3,393.9	3,410.5	3,427.2	3,709.7	3,416.7	3,194.0	3,635.5	4,661.7	
		100	107.7	116.0	125.0	134.6	156.6	157.4	158.1	171.2	157.7	147.4	167.8	215.1	6.6%
14	Electric machine and apparatus manufacturing	2,766.8	3,038.3	3,336.5	3,663.9	4,023.4	4,701.8	4,596.7	4,493.9	5,157.1	5,233.8	4,742.1	4,968.6	5,342.5	
		100	109.8	120.6	132.4	145.4	169.9	166.1	162.4	186.4	189.2	171.4	179.6	193.1	5.6%
15	Other industry	2,457.1	2,490.3	2,523.9	2,558.0	2,592.5	2,910.1	2,792.7	2,680.0	2,859.4	2,918.0	2,744.5	2,964.2	3,345.5	
		100	101.4	102.7	104.1	105.5	118.4	113.7	109.1	116.4	118.8	111.7	120.6	136.2	2.6%
	Total manufacturing	3,084.4	3,177.3	3,273.0	3,371.6	3,473.2	3,697.5	3,743.7	3,790.4	4,005.9	3,847.5	3,735.9	3,962.8	4,610.4	
		100	103.0	106.1	109.3	112.6	119.9	121.4	122.9	129.9	124.7	121.1	128.5	149.5	3.4%

Sources: Net value added from table 8, Employment from Annex table A.4. Original sources: Net value added from *Industrial Economy Statistics Yearbook, 1993*, pp. 142-154; deflators from SSB, *China Statistical Yearbook, 1993*, Beijing, 1993, table T7.24, pp. 238; employment from SSB, *Industrial Economy Statistics Yearbook*, 1993.

6.6 Net Value Added per Person Employed in 1975

In order to make comparisons with other ICOP results for the first ICOP benchmark year of 1975, it would be extremely useful to have Chinese time series of value added per person in manufacturing spanning the whole period 1975-1992. So far, we have not been able to find consistent series for real value added in manufacturing going back further than 1980. The long-run series in table 9 refer to gross value of output (MPS concept) and it is not possible to separate information on manufacturing from the data on industry as a whole. Wu's series (table 10) are based on SNA concepts, but they refer to industry as a whole, including mining, manufacturing, utilities and construction.[14] The situation is even worse with regard to employment figures. It is very difficult to find consistent series on employment by branches of manufacturing spanning more than a few years (see Annex table A.5), let alone data for branches of manufacturing.

TABLE 13
Estimate of Net Value Added per Person Employed in Chinese Manufacturing in 1975

		1975	1976	1977	1978	1979	1980
1.	NVA at factor cost in manufacturing at constant 1980 bil. yuan (Szirmai/Ren, see table 8)						129.1
2.	Employment in manufacturing (00.000) (Szirmai/Ren, see table A.4)						418.6
3.	NVA per person in manufacturing (1/2)						3,084.4
4.	GDP at factor cost in industry at constant 1980 bil. yuan (Wu, table 10) Index (1980=100)	67.0	65.0	73.8	85.2	91.7	100.0
5.	Employment in industry (00.000) (1975 Rawski; 1980 Table A.4) (a)	396.0					502.8
	index 1980=100	78.8					100.0
6.	Employment in manufacturing index 1980 = 100 (World Tables) (b)	89.5		93.6	94.5	95.9	100.0
7.	NVA per person in manufacturing at constant 1980 yuan (estimate using indexes from rows 4 and 5)	2624.3					
8.	NVA per person in manufacturing at constant 1980 yuan (estimate using indexes from rows 4 and 6)	2309.6					

Sources: Row 1 from table 8; row 2 from Annex table A.4. Original source: *1993 China Industrial Statistics Yearbook*; Row 4: GDP in industry from table 10. Original source Wu (1993).
Row 5: Employment in total industry 1975 from Rawski (1979). p. 43; employment in total industry in 1980 from table A.4. Original source *1993 Industrial Economy Statistics Yearbook*.
Row 6: index of employment in manufacturing from World Bank, *World Tables*, 1994.
The preferred estimate of nva/person in row 7 is based on the assumption that one can apply the index for GDP in total industry from Wu and the index for employment in total industry calculated from Rawski and the Industrial Economy Statistics Yearbook to backdate the 1980 figure for net value added per person to 1975. The alternative estimate in row 8 again uses Wu's index for GDP. For employment we used and index of manufacturing employment from 1977 to 1980 from *World Tables* and assumed that the growth rate of employment between 1975 and 1977 was the same as between 1977 and 1980.

Notes: (a) Including mining, manufacturing and utilities, excluding construction. Source Rawski 1979, p. 43
(b) No data for 1975. Employment index for 1975 calculated on the assumption that the growth rate of employment for 1977-1980 could be applied for the period 1975-77.

[14] Wu does not discuss utilities. On the basis of the original data, we assume that utilities are included in industry as in the industrial yearbook data and the census data.

In table 13, we have made a first rough attempt to develop a series of value added per person in total manufacturing going back to 1975, using information from Wu (1993), *World Tables 1994* and Rawski (1979). Wu's estimates of growth of GDP in industry are the best estimates for the period 1975-1980. Unfortunately, they refer to total industry, rather than to manufacturing proper. We had to assume that the trends for industrial GDP are representative for trends in manufacturing net value added as well. An alternative would be to use series of GDP at factor cost in manufacturing at constant 1975 prices from *World Tables, 1993*. However, these series show unrealistically high growth rates between 1975 and 1980 and there is hardly any difference between the series at constant prices and series at current market prices. In the 1994 edition of *World Tables* this series has been dropped.

For employment we have two alternatives. *World Tables 1994* provides an index of employment in manufacturing from 1977 onwards. Assuming that the growth rate of employment between 1975 and 1977 was the same as between 1977 and 1980, we can make an estimate for 1975 (table 13, row 6). An alternative is to use an estimate for employment in total industry in 1975 derived from Rawski (1979) and relate this to the 1980 employment figure in industry from the *1993 Industrial Economy Statistics Yearbook*). We assume that the resulting 1975-1980 index for employment in industry is applicable to manufacturing as well. Application of these indexes to backcast the 1980 figure for net value added per person employed results in provisional estimates of NVA per person in 1975. Our preferred estimate is the estimate based on the employment index derived from Rawski (see table 13, rows 4 and 5). Net value added per person employed in manufacturing is estimated at 2624.3 yuan per person (see table 13, row 7). This estimate represents a lower bound. We know from table 11 that our growth rates for net value added tend to be lower than Wu's growth rates for GDP.

7 Comparative Productivity China/USA 1975 - 1992

In table 14 we have extrapolated the results of the 1985 benchmark using Chinese and US time series of real value added per person employed. The Chinese time series have been presented in section 6.2 (see table 8). A drawback of these series is that they refer to net value added, while the benchmark is in terms of gross value added. The time series cover the period 1980-1992. The US series derive from the *National Income and Product Accounts* and the *Survey of Current Business* (see van Ark and Pilat, 1993, pp. 40 ff.). They are reproduced as Annex tables A.6 (GDP), A.7 (employment) and A.8 (labour productivity). We have used our rough estimate of Chinese net value added per person in 1975 from table 13 in order to take the comparison back to 1975.

The most important finding is the absence of significant change in aggregate Chinese relative labour productivity in manufacturing between 1980 and 1992. Labour productivity decreased from 4.9 per cent of the US level in 1980 to 4.4 per cent in 1991. There was a sudden recovery to 4.9 per cent of the US level in 1992, which resulted in the same level of relative labour productivity as in 1980. Between 1975 and 1980 Chinese labour productivity increased from 4.5 to 4.9 per cent of the US level. But the provisional nature of our Chinese figure for 1975 should once again be stressed. At branch level the trends varied. There were relative productivity gains in

TABLE 14
Comparative Productivity by Manufacturing Branch
China/USA, 1980-1990, USA=100

	Food & Beverages	Tobacco Products	Textile Mill Products	Wearing Apparel	Leather Products & Footwear	Wood Products, Furniture, Fixtures	Paper Products, Printing & Publishing	Chemicals, Petroleum & Coal Products	Rubber and Plastic Products	Non-Metallic Mineral Products	Basic & Fabricated Metal Products	Machinery and Transport Equipment	Electrical Machinery and Equipment	Other Manufac-turing	Total Manufac-turing
1975															4.5
1980	3.5	2.3	8.2	5.4	11.1	3.8	3.0	5.8	5.8	6.2	8.9	2.6	7.5	3.8	4.9
1981	3.5	2.4	7.9	5.7	11.0	4.3	3.0	5.8	5.3	6.5	8.9	2.9	8.1	3.5	5.0
1982	3.3	2.7	7.4	5.9	10.6	4.1	3.0	5.6	5.3	6.6	10.0	3.1	9.0	3.6	5.2
1983	3.2	2.9	6.4	5.7	10.4	3.8	3.0	5.0	4.9	6.2	10.1	2.8	9.4	3.7	4.9
1984	3.2	2.9	6.3	6.0	9.8	3.6	3.1	4.6	4.8	6.2	9.7	2.7	10.0	3.2	4.8
1985	3.1	3.5	6.5	6.4	10.8	3.6	3.2	4.6	4.5	5.9	9.5	2.9	11.4	3.8	4.8
1986	3.3	3.2	5.9	6.3	12.3	3.2	3.1	4.3	4.4	5.6	9.8	2.7	10.8	3.3	4.7
1987	3.4	4.4	5.9	6.2	11.5	2.6	3.0	4.1	4.1	5.8	9.2	2.6	9.2	3.1	4.5
1988	3.6	5.0	5.9	6.2	10.6	2.7	3.1	4.0	4.4	6.0	9.5	2.6	10.1	2.8	4.6
1989	3.7	5.5	5.3	6.1	10.0	2.5	2.8	3.7	4.1	5.3	9.6	2.4	9.5	2.9	4.3
1990	3.7	6.4	4.8	5.8	10.3	2.5	2.8	3.9	4.0	5.2	8.2	2.2	8.2	2.6	4.2
1991	4.5	6.9	4.3	5.9	10.0	2.8	2.9	4.1	4.0	6.1	7.8	2.5	7.9	2.7	4.4
1992	4.6	7.5	4.6	6.7	8.6	3.3	3.2	4.6	4.3	7.4	9.1	3.0	8.2	3.0	4.9

Sources: United States GDP/person from Annex table A.8. Original sources: GDP from US Dept. of Commerce, *National Income and Product Accounts of the United States, Vol. 2, 1959-88*, Washington DC, 1992; and US Department of Commerce, *Survey of Current Business*, January 1991, April 1991, November 1992 and October 1994; Employment from: *NIPA, Vol. 2 1959-88*, Washington DC, 1992; and US Dept. of Commerce, *Survey of Current Business*, Washington D.C. Various Issues.
China: Net value added per person from table 11. Original sources: Net value added from *China 1993 Industrial Economy Statistics Yearbook*, pp. 142-154; deflators from SSB, *1993 China Statistical Yearbook*, Beijing, 1993, table T7.24, pp. 238; employment from SSB, *China 1993 Industrial Economy Statistics Yearbook*; NVA/person 1975 from Table 13. Benchmark productivity comparison for 1985 from table 5.

food and beverages, wearing apparel, machinery and transport equipment, electrical machinery and equipment and non-metallic minerals. The most impressive gains were found in tobacco products, where relative productivity more than tripled. Six of the fourteen branches showed decreases in relative productivity. In textile mill products there was quite a dramatic decline in relative productivity from 8.2 per cent of the US level at the beginning of the 1980's to 4.6 per cent in 1992. Chemical products and leather products also showed marked declines in relative performance.

Table 15 emphasises the substantial productivity growth in most branches of Chinese manufacturing. The modest increase in relative productivity performance was due to the fact that productivity was also increasing in the USA in the same period. The relative decline of labour productivity in leather products, chemical products, rubber and plastic products and other manufacturing was caused by the fact that labour productivity was growing more rapidly in the USA than in China. Only in the textile mill branch was the decline in relative labour productivity associated with an absolute decline in labour productivity.

TABLE 15
Labour Productivity by Manufacturing Branch, 1980-1992 in China and the USA (1980=100)

	China	USA	China/ USA
Food & Beverages	162.0	121.8	133.0
Tobacco Products	147.5	46.0	320.4
Textile Mill Products	83.0	148.1	56.0
Wearing Apparel	177.7	141.6	125.4
Leather Products & Footwear	117.1	151.8	77.1
Wood Products, Furniture, Fixtures	90.8	103.3	87.9
Paper Products, Printing & Publishing	119.9	112.7	106.4
Chemicals, Petroleum & Coal Products	136.9	172.9	79.2
Rubber and Plastic Products	121.1	160.9	75.3
Non- Metallic Mineral Products	156.0	132.3	117.9
Basic & Fabricated Metal Products	128.8	126.6	101.7
Machinery and Transport Equipment	215.1	191.4	112.4
Electrical Machinery and Equipment	193.1	177.5	108.8
Other Manufacturing	136.2	172.9	78.7
Total Manufacturing	149.5	151.4	98.7

Sources: see source note for table 14.

Table 16 serves to put Chinese manufacturing productivity performance in an international perspective, by comparing it with results of other ICOP studies for Asia. Compared to the other Asian giant India, China appears to have very low labour productivity. However, one should keep in mind that the benchmark for China includes small scale manufacturing, while the benchmarks for India (and Indonesia) are based on data for medium and large scale manufacturing only. In section 5, we found that after excluding small scale manufacturing in both China and the USA, Chinese labour productivity in 1985 was between 7.2 and 7.6 per cent of the US level. This puts China close to India, where labour productivity in medium and large scale manufacturing in 1985 was 7.6 per cent of the US level. As we noted in section 5, however, there is no clearcut general demarcation between small scale manufacturing and the rest of manufacturing in China.

While India showed a marked improvement of relative productivity between 1980 and 1986, the Chinese data showed no change in relative productivity performance over the same period. Between 1980 and 1992 productivity relative to the USA remained at the same level.

Thus the main conclusion of this paper is that Chinese manufacturing in the 1980's was characterised by extremely rapid growth of production, but no decrease in the productivity gap vis à vis the world productivity leader, the United States. Indonesia shows a similar pattern, but at a somewhat higher level of relative productivity. Given rapid productivity increases in Korea and Japan, the productivity gap between China and the leading Asian economies is even growing. Further empirical research is needed to check whether the picture emerging from the present data is reliable, and if so, to offer explanations for the trends outlined here.

TABLE 16
Real GDP per Person Employed in Asian in Manufacturing (USA=100)

	India (a)	Korea	Japan	Indonesia (a)	China	USA
1970	7.0	13.8	58.9			100
1971	6.3	15.8	57.8			100
1972	6.1	14.5	59.9			100
1973	6.0	15.4	61.6			100
1974	6.0	14.3	63.4			100
1975	5.8	17.6	64.1	7.7	4.5	100
1976	5.7	17.3	66.8	8.0		100
1977	5.8	17.8	67.7	8.0		100
1978	6.2	20.6	71.6	9.4		100
1979	5.7	18.4	77.7	9.0		100
1980	5.6	20.4	82.3	10.6	4.9	100
1981	6.1	22.7	84.3	11.5	5.0	100
1982	6.9	23.9	88.3	10.5	5.2	100
1983	7.1	24.4	83.6	9.3	4.9	100
1984	7.1	25.3	83.7	9.9	4.8	100
1985	7.7	24.5	85.0	10.5	4.8	100
1986	7.9	25.4	79.7	11.5	4.7	100
1987		26.4	81.8	10.0	4.5	100
1988		26.7	83.1	11.0	4.6	100
1989		28.9	87.1	10.5	4.3	100
1990			89.4	10.9	4.2	100
1991					4.4	100
1992					4.9	100

Notes: (a) The India/USA and Indonesia/USA comparisons are for large and medium sized establishments, the Korea/USA and Japan/USA comparisons are for total manufacturing.

Source: India/USA from Van Ark (1991), Japan/USA from Van Ark and Pilat (1993); Korea/USA from Pilat (1994). Indonesia/USA from Szirmai (1994); China/USA 1975 from table 12.

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STATISTICAL ANNEX

This Annex contains 11 background tables:
Table A.1 presents data on gross value of output and net value added by branch of industry, deriving from the 1993 edition of the *Industrial Economy Statistics Yearbook*. This table illustrates the categorisation of activities within the industrial sector. It shows how these statistics have been recategorised into 15 ICOP type branches.
Tables A.2 and A.3 derive from the 1993 edition of the *China Statistical Yearbook*. They present producer price indices for fourteen branches of industry including four mining branches. The application of the price indices of table A.3 to the output and value added data of table A.1 is discussed in the footnotes to text table 10. Annex tables A.4 and A.5 present information on trends in manufacturing employment. Annex tables A.6, A.7 and A.8 present US time series on GDP, employment and labour productivity. Table A.9 and A.10 present real gross output and real gross output comparisons between China and the USA for 1985. These tables complement text tables 6 and 7, where these comparisons are made for value added. Finally, table A.11 provides an example of our worksheets for sample industry grain mill products.

Table A.1: Gross Value of Output and Net Value Added by Industry, China, 1980-1992

(100,000,000 yuan, in current prices)

Category of Industry		1980	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total	GVO	4,702.5	6,818.4	8,434.7	9,436.3	11,318.6	14,586.5	17,473.9	18,689.2	22,088.7	27,724.2
	NVA	1,598.3	2,235.1	2,736.6	2,978.7	3,487.7	4,301.4	4,903.4	5,093.3	5,915.1	7,447.0
Subdivided in:											
A1 State-owned Enterprises	GVO	3,798.9	5,183.9	6,167.1	6,754.1	7,996.8	9,946.7	11,873.0	12,570.5	14,371.7	17,091.1
	NVA	1,302.6	1,728.9	2,039.0	2,178.1	2,530.0	3,063.0	3,460.2	3,568.7	4,019.1	4,844.0
A2 Collective Enterprises	GVO	870.6	1,559.2	2,149.2	2,536.5	3,143.5	4,219.6	4,945.3	5,246.5	6,177.9	8,106.4
	NVA	285.2	485.4	666.2	762.9	894.0	1,135.2	1,288.1	1,323.4	1,551.2	2,009.7
A 3 Other Ownership	GVO	33.1	75.3	118.4	140.8	241.3	420.2	655.6	872.3	1,539.1	2,526.7
	NVA	10.5	20.1	31.4	37.7	63.7	103.3	155.1	201.2	344.8	593.2
Subdivided in:											
B1 Light industry	GVO	2,153.1	3,097.8	3,814.9	5,316.9	5,246.9	6,881.9	8,149.3	8,776.8	10,229.9	12,217.7
	NVA	642.1	861.4	1,060.0	1,208.8	1,424.4	1,822.7	2,068.1	2,212.5	2,555.5	3,068.1
B1.1 Using agricultural products as input	GVO	1,625.4	2,249.6	2,702.0	2,990.8	3,647.9	4,717.0	5,626.4	6,119.5	7,000.1	8,279.0
	NVA	441.4	575.5	703.5	793.9	954.7	1,227.0	1,412.1	1,515.5	1,703.2	2,031.3
B1.2 Using non-agricultural products as input	GVO	527.7	848.3	1,112.9	1,326.0	1,599.0	2,164.9	2,522.9	2,657.3	3,229.8	3,938.7
	NVA	200.4	286.0	356.5	414.9	469.7	595.7	656.0	697.0	852.4	1,036.7
B2 Heavy industry	GVO	2,549.5	3,720.7	4,619.9	5,119.5	6,134.7	7,704.5	9,324.6	9,912.5	11,858.8	15,506.5
	NVA	956.1	1,373.7	1,676.6	1,769.9	2,063.3	2,478.8	2,835.3	2,880.8	3,359.6	4,378.9
B2.1 Mining industry	GVO	346.6	486.2	580.8	634.4	757.3	873.9	1,073.6	1,200.3	1,387.0	1,628.0
	NVA	175.8	251.6	289.5	304.9	376.4	404.8	446.8	495.5	555.8	661.8
B2.2 Materials industry	GVO	1,049.0	1,445.5	1,741.6	2,023.8	2,401.2	2,972.1	3,724.0	4,122.2	4,947.5	6,364.9
	NVA	390.3	528.0	619.0	683.9	784.2	937.9	1,083.4	1,099.5	1,288.8	1,651.8
B2.3 Processing industry	GVO	1,153.9	1,788.8	2,297.5	2,460.9	2,976.1	3,858.5	4,526.9	4,590.0	5,524.3	7,513.6
	NVA	390.1	594.1	768.1	781.1	902.2	1,136.0	1,305.1	1,285.6	1,515.0	2,065.2
Subdivided in:		4,702.5									
C 1 Large enterprise	GVO	1,604.1	2,166.6	2,545.6	2,868.4	3,528.1	4,484.7	5,769.3	4,509.2	7,959.6	1,008.3
	NVA	649.9	846.4	993.2	1,047.6	1,284.0	1,543.1	1,832.1	2,000.0	2,364.4	3,335.9
C 2 Middle enterprise	GVO	1,022.7	1,350.5	1,637.1	1,831.4	2,222.9	2,872.7	3,454.3	3,693.9	4,409.5	5,836.1
	NVA	341.5	425.6	516.3	571.8	657.2	826.9	930.3	926.4	1,125.5	1,503.0
C 3 Small enterprise	GVO	2,075.7	3,301.2	4,252.0	4,736.6	5,630.6	7,229.1	8,250.3	8,486.1	9,722.6	11,806.7
	NVA	606.9	945.1	1,227.2	1,359.3	1,546.6	1,931.5	2,141.0	2,130.9	2,452.2	2,826.6
Total mining (our total)		326.5									
Coal mining industry	GVO	135.4	183.7	222.8	235.6	253.3	309.5	408.1	457.5	518.9	612.3
	NVA	62.5	81.5	91.5	97.5	101.8	129.1	160.2	158.1	177.4	286.0
Petroleum and gas mining industry	GVO	123.2	178.7	215.1	231.8	292.2	302.3	362.4	427.2	515.0	611.2
	NVA	69.1	108.2	125.6	127.4	174.3	151.9	148.8	203.5	230.4	360.8
Black metal mining industry	GVO	9.0	13.1	17.4	19.4	22.4	26.2	30.4	37.0	47.8	59.4
	NVA	3.9	6.2	7.7	8.4	8.9	10.1	11.2	12.7	16.3	23.7
Colour metal mining industry	GVO	21.5	28.8	37.0	44.2	56.0	70.9	93.8	103.1	113.5	125.6
	NVA	8.9	11.4	15.5	18.0	22.2	26.7	35.0	37.4	40.2	50.0
Building materials and other non-metal mining	GVO	19.6	29.6	33.4	41.2	47.7	63.0	79.8	89.9	99.4	125.3
	NVA	10.6	15.6	17.2	18.5	20.1	25.8	31.2	33.1	40.0	48.1

Table A 1 Gross Value of Output and Net Value Added by Industry

(100,000,000 yuan, in current prices)

ICOP BRANCH	Category of Industry		1980	1984	1985	1986	1987	1988	1989	1990	1991	1992
	industry											
	Salt mining industry	GVO	17.9	18.9	18.5	23.0	23.7	31.3	42.1	38.7	42.7	51.0
		NVA	14.3	14.3	13.5	16.9	15.9	20.2	25.9	21.3	25.0	31.9
	Other mining industry	GVO	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.5
		NVA	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1
	Timber and bamboo	GVO	38.6	53.3	56.5	64.8	87.3	104.9	104.1	92.1	100.9	105.5
	cutting industry (Logging)	NVA	20.9	29.1	32.4	35.7	49.6	62.2	62.0	52.9	57.6	62.1
	Total utilities		203.4									
	Producing and supplying	GVO	10.7	16.5	19.2	22.1	25.9	31.8	37.0	45.3	65.0	80.8
	water industry	NVA	5.3	7.6	8.4	9.4	10.1	12.0	12.3	14.2	25.2	40.0
	Total manufacturing (our total)		4,134.0									
	Manufacturing											
1/2	Food and beverages	NVA	80.1	121.4	145.3	165.2	200.1	265.9	295.1	316.1	401.1	445.5
1	Food manufacturing	GVO	393.6	553.2	632.9	704.4	806.4	1,038.5	1,203.0	1,265.8	1,473.4	1,671.9
	industry	NVA	55.9	80.4	95.4	112.2	131.3	167.0	191.1	200.6	248.7	260.9
2	Beverage manufacturing	GVO	67.3	120.5	149.9	167.9	228.6	306.6	348.6	385.0	462.5	568.4
	industry	NVA	24.2	41.0	49.9	53.0	68.8	98.9	104.0	115.5	152.4	184.6
3	Tobacco processing	GVO	86.0	164.9	202.3	224.5	277.1	368.0	450.9	512.0	547.5	646.5
	industry	NVA	53.3	103.0	116.8	140.1	170.7	222.2	260.8	297.5	316.3	352.0
	Forage industry	GVO	2.1	13.3	24.9	36.8	51.1	88.6	114.7	123.5	153.4	199.7
	(include in 1)	NVA	0.3	1.8	3.3	4.9	6.6	11.0	12.9	14.1	19.5	21.6
4	Textile industry	GVO	699.1	888.2	1,056.4	1,163.3	1,373.5	1,728.2	2,109.6	2,291.1	2,533.3	2,899.2
		NVA	199.8	202.4	250.5	284.1	321.8	407.3	477.6	492.6	502.8	548.0
5	Clothing industry	GVO	107.1	141.7	171.8	186.9	227.5	286.0	352.7	414.6	523.0	681.6
		NVA	25.8	37.8	49.0	52.7	61.3	73.6	90.7	100.9	122.4	147.2
6	Leather, fur and	GVO	50.1	61.3	84.1	100.1	119.8	150.2	175.3	199.1	253.4	325.1
	manufactured products industry	NVA	13.4	15.9	22.1	26.0	30.2	34.1	38.6	45.2	55.6	62.6
7	Timber processing and	GVO	30.6	49.3	56.7	64.1	80.2	100.2	106.8	103.2	122.3	157.3
	bamboo, cane, palm, and straw manufactures	NVA	9.5	14.6	16.3	18.3	22.2	26.4	27.7	24.0	28.1	36.2
7	Furniture manufacturing	GVO	22.9	36.7	47.4	51.0	62.4	77.0	82.0	81.4	90.4	114.1
	industry	NVA	7.8	11.9	15.0	15.8	18.3	21.6	22.6	21.7	24.0	27.5
8	Paper and paper manu-	GVO	87.9	122.8	153.9	177.2	228.9	309.9	372.1	388.7	423.4	492.9
	factured products industry	NVA	27.5	35.0	45.1	50.7	62.8	83.8	92.2	93.2	98.7	113.7
8	Printing industry	GVO	47.2	66.7	84.0	93.5	111.9	138.6	158.2	173.4	216.4	262.4
		NVA	14.7	21.9	27.5	30.3	34.7	40.7	46.5	49.6	59.3	73.2
15	Culture , education	GVO	21.8	30.1	37.7	43.8	58.5	66.9	76.1	90.1	117.1	147.6
	and sports products manufacturing industry	NVA	8.6	11.2	13.6	15.5	19.5	21.1	22.9	25.6	33.1	37.7
15	Crafts and arts	GVO	36.2	43.6	79.5	80.4	103.8	138.3	170.5	190.9	219.4	283.4
	manufacturing industry	NVA	14.3	16.2	23.0	28.0	35.4	44.1	53.5	57.4	65.5	74.3

Table A 1: Gross Value of Output and Net Value Added by Industry

(100,000,000 yuan, in current prices)

Category of Industry		1980	1984	1985	1986	1987	1988	1989	1990	1991	1992
- Producing and supplying electricity, steam and hot water	GVO	192.7	256.7	293.2	309.9	362.3	431.2	557.2	676.6	828.4	1,021.3
	NVA	111.6	137.1	153.8	142.9	157.0	173.7	199.5	242.8	284.1	481.5
9 Petroleum processing industry	GVO	169.2	229.8	256.0	297.9	338.7	392.3	457.3	501.9	714.9	900.3
	NVA	68.4	95.2	105.5	121.3	129.9	140.5	133.4	129.8	168.8	224.7
9 Coking and coal gas and coal products	GVO	14.9	20.0	25.4	27.5	32.9	42.0	56.5	71.4	84.4	92.9
	NVA	2.6	3.5	4.9	5.6	6.1	6.6	7.7	10.0	12.2	14.5
9 Chemical industry	GVO	355.0	526.1	564.9	638.9	819.3	1,091.9	1,375.3	1,492.0	1,625.1	1,911.2
	NVA	108.3	159.8	165.4	180.0	231.6	312.0	369.7	395.4	418.3	514.9
9 Medical industry	GVO	69.8	113.7	127.3	154.4	207.6	289.1	323.1	356.1	453.6	569.0
	NVA	22.2	33.5	36.5	52.5	57.9	80.2	83.1	93.8	131.3	160.3
9 Chemical fibre industry	GVO	33.8	60.1	79.3	99.3	129.0	172.1	233.8	272.4	325.4	371.5
	NVA	12.4	19.1	27.0	32.5	40.1	51.2	61.0	76.7	94.6	116.7
10 Rubber manufactured products industry	GVO	88.2	117.1	138.1	148.3	166.1	207.2	264.3	284.9	317.3	381.3
	NVA	32.5	40.3	46.6	47.5	49.2	56.1	70.4	76.7	87.9	106.3
10 Plastic manufactured products industry	GVO	66.3	113.6	141.2	162.0	207.9	324.5	347.4	349.8	439.2	566.0
	NVA	19.0	30.5	38.1	41.5	51.7	73.4	80.1	83.0	98.2	123.8
11 Building materials and other non-metallic mineral manufacturing industry	GVO	201.0	325.4	422.7	516.9	593.2	752.9	891.9	890.6	1,055.4	1,422.4
	NVA	80.5	124.9	162.4	197.3	212.9	260.1	284.2	274.3	338.9	491.5
12 Ferrous metal smelting and pressing industry	GVO	315.3	419.8	542.6	660.5	766.2	931.1	1,140.0	1,298.8	1,538.5	2,080.8
	NVA	96.6	137.5	167.8	193.3	227.1	273.5	325.4	314.3	374.7	583.9
12 Non-ferrous metal smelting and pressing industry	GVO	124.1	160.8	196.6	232.7	276.0	352.4	471.5	509.5	573.6	709.1
	NVA	29.3	35.2	44.8	51.5	61.4	80.2	103.5	98.1	107.3	142.5
12 Metal manufactured products industry	GVO	124.8	177.3	233.6	274.1	338.0	411.5	494.2	522.6	615.2	800.4
	NVA	43.0	58.3	75.6	86.4	100.2	118.0	136.5	140.9	159.3	187.5
13 Machine industry	GVO	467.4	709.4	935.3	1,016.0	1,233.0	1,554.3	1,726.6	1,674.1	1,995.4	2,671.5
	NVA	169.4	241.8	320.2	339.0	388.7	472.8	519.8	483.9	565.0	741.4
13 Transportation equipment manufacturing industry	GUO	172.3	274.9	380.1	346.7	426.0	574.5	670.1	713.9	975.8	1,544.0
	NVA	52.8	83.7	121.5	100.9	119.1	156.8	174.2	187.4	244.9	381.7
14 Electric machine and apparatus manufacturing industry	GVO	152.3	250.9	355.3	406.8	480.9	665.8	849.8	797.1	917.1	1,236.2
	NVA	51.4	79.9	112.5	120.7	134.2	176.3	223.1	209.9	238.4	288.0
14 Electronic and communication equipment manufacturing industry	GVO	76.1	169.4	243.9	241.6	339.0	497.5	551.2	584.2	764.7	928.4
	NVA	26.3	56.6	75.9	67.7	89.0	126.7	142.5	146.2	184.2	205.6
15 Instrument, instrument meter and other measuring instrument manufacturing industry	GVO	40.0	58.5	69.6	71.1	81.5	101.1	113.1	110.1	136.7	182.6
	NVA	17.6	24.7	29.5	29.1	31.7	38.2	43.1	40.3	49.5	58.9
15 Other industry	GVO	11.7	19.4	28.3	55.9	45.5	58.6	72.4	73.5	89.3	112.8
	NVA	4.0	6.5	9.3	15.8	12.7	15.7	18.8	18.7	22.3	26.1

Source: SSB, China 1993 industrial statistics yearbook, P142-154

Table A.2: Industrial Products Producer Price Index by Sector, China, 1979-1992
(preceding year = 100)

ICOP BRANCH	Category of Industry	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
	Overall index	101.5	100.5	100.2	99.8	99.9	101.4	108.7	103.8	107.9	115.0	118.6	104.1	106.2	106.8
	Metallurgical Industry (a)	101.6	106.2	101.8	101.0	101.3	103.8	114.3	107.4	107.0	115.4	121.0	110.3	114.2	114.2
	Power Industry	101.7	98.4	101.6	98.9	105.6	102.1	103.4	102.4	103.1	101.7	105.9	107.4	116.9	108.8
	Coal Industry	113.4	106.4	102.6	101.9	101.5	102.6	117.6	96.8	102.8	110.6	112.2	106.2	113.1	116.1
	Petroleum Industry (b)	100.6	102.1	99.3	100.5	106.3	112.0	107.2	104.6	104.0	106.8	108.4	107.1	118.8	115.3
	Chemical industry	99.6	98.2	97.2	99.6	101.0	102.4	102.9	102.9	112.2	120.4	119.4	101.6	102.4	102.7
	Machine building industry	99.9	97.5	98.6	99.3	99.3	101.1	111.8	102.8	104.9	111.8	121.2	102.8	102.8	106.6
	Building materials	103.5	102.5	101.6	102.2	102.7	102.0	115.4	113.7	105.6	113.4	123.6	99.6	106.1	111.1
	Wood products (c)	102.5	104.5	111.3	105.8	100.3	103.2	114.9	107.1	144.9	119.6	115.7	94.6	100.4	105.9
	Food manufacturing	103.6	101.2	102.3	103.1	100.8	101.7	105.5	102.5	109.4	116.3	114.3	101.0	103.3	106.2
	Textiles	97.9	101.6	99.1	96.5	94.8	96.6	104.3	102.6	108.3	122.3	122.4	107.2	104.1	99.3
	Sewing industry	101.1	100.8	99.9	96.1	95.7	100.4	105.1	100.0	109.6	116.2	118.9	109.1	109.0	100.8
	Leather industry		102.4	101.7	99.5	100.9	100.6	112.1	101.7	102.9	114.4	118.3	106.3	109.0	112.8
	Paper making	108.3	100.5	100.6	100.3	101.1	99.7	113.7	105.7	112.1	120.7	123.0	102.3	102.9	102.7
	Cultural etc.		101.6	99.0	100.0	99.9	100.4	103.2	99.6	120.0	112.1	111.0	107.3	105.8	102.3

Source: SSB, China Statistical Yearbook, 1993, Beijing, 1993, table T7.24, pp. 238.

Notes: (a) including metal mining (assumption)
(b) including petroleum refining (assumption)
(c) including logging

Table 3: Industrial Products Producer Price Index by Sector, China, 1979-1992
(1980 = 100)

ICOP BRANCH	Category of Industry	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
	Overall index	99.5	100	100.2	100.0	99.9	101.3	110.1	114.3	123.3	141.8	168.2	175.1	186.0	198.6
	Metallurgical Industry (a)	94.2	100	101.8	102.8	104.2	108.1	123.6	132.7	142.0	163.9	198.3	218.7	249.8	285.2
	Power Industry	101.6	100	101.6	100.5	106.1	108.3	112.0	114.7	118.3	120.3	127.4	136.8	159.9	174.0
	Coal Industry	94.0	100	102.6	104.5	106.1	108.9	128.0	123.9	127.4	140.9	158.1	167.9	189.9	220.5
	Petroleum Industry (b)	97.9	100	99.3	99.8	106.1	118.8	127.4	133.2	138.6	148.0	160.4	171.8	204.1	235.3
	Chemical industry	101.8	100	97.2	96.8	97.8	100.1	103.0	106.0	119.0	143.2	171.0	173.7	177.9	182.7
	Machine building industry	102.6	100	98.6	97.9	97.2	98.3	109.9	113.0	118.5	132.5	160.6	165.1	169.7	180.9
	Building materials	97.6	100	101.6	103.8	106.6	108.8	125.5	142.7	150.7	170.9	211.2	210.4	223.2	248.0
	Wood products (c)	95.7	100	111.3	117.8	118.1	121.9	140.0	150.0	217.3	259.9	300.7	284.5	285.6	302.5
	Food manufacturing	98.8	100	102.3	105.5	106.3	108.1	114.1	116.9	127.9	148.8	170.0	171.7	177.4	188.4
	Textiles	98.4	100	99.1	95.6	90.7	87.6	91.3	93.7	101.5	124.1	151.9	162.9	169.6	168.4
	Sewing industry	99.2	100	99.9	96.0	91.9	92.2	96.9	96.9	106.3	123.5	146.8	160.2	174.6	176.0
	Leather industry	97.7	100	101.7	101.2	102.1	102.7	115.1	117.1	120.5	137.8	163.1	173.3	188.9	213.1
	Paper making	99.5	100	100.6	100.9	102.0	101.7	115.6	122.2	137.0	165.4	203.4	208.1	214.1	219.9
	Cultural etc.	98.4	100	99.0	99.0	98.9	99.3	102.5	102.1	122.5	137.3	152.4	163.5	173.0	177.0

Source: calculated from table A.2
Notes: as in table A.2

Employment Figures

The employment figures merit special discussion. In this annex, we discuss and compare figures from three different sources: 1. the *China Statistical Yearbook*; 2. the *1985 Industrial Census* and 3 the *Industrial Economy Statistical Yearbook.*

Subsequent editions of the China Statistical Yearbook provide labour input figures for total manufacturing and total industry for various years. But there are large discrepancies from year to year (see table A.5). For instance, the employment figure for total industry in 1985 is 55.6 million persons in the 1991 edition and 49.2 million persons in the 1990 edition. The employment figure for 1989 is 63.8 million in the 1991 edition against 42.7 million in the 1990 edition. Similar discrepancies are found for the manufacturing sector.

The 1993 and 1994 editions of the *China Statistical Yearbook* (SSB, 1993b; SSB 1994) provide consistent long-run series for the first time. In these editions a distinction is made between the 'social labour force' and the more limited concept of 'staff and workers'. The latter concept excludes individual labourers in urban and in rural areas and employees of private enterprises (with the exception of private-state joint ventures and private-collective joint ventures). In 1985 the social labour force comprises 28 million more persons than staff and workers. The employment figures explicitly include village level workers.

The *Industrial Census 1985* (PRC, 1987/88) provides employment figures for 1984 and 1985. According to the introduction the census figures for output and employment include village level activities. However, the census only refers to activities of 'independent accounting units'. The employment figures may thus exclude self-employed persons and individual labourers. This would suggest that the employment concept is similar to that of 'staff and workers' from the *China Statistical Yearbook*, but one cannot be quite sure of this.

The *1993 Industrial Economy Statistics Yearbook* (SSB, 1993c) is the only source which provides time series for labour input by branch of industry from 1980 to 1992. The data for branches of manufacturing have been reproduced in Annex table A.4. Data for 1981, 1982, 1983 and 1986 are lacking. In the text tables they have been calculated by interpolation. The figures from the *Industrial Economy Statistics Yearbook* are supposedly based on the census, but the totals do not quite tally for 1985. The heading of the table on employment refers to 'staff and workers', but again it is not quite certain which employment concept is actually being used. It may also be the 'social labour force' concept. Separate tables on employment figures for 1992 make a clearcut distinction between workers above village level and workers at village level. If the same distinction applies to the data for 1985, the 1985 figures should exclude village level workers, but this is not explicity stated. In conclusion, the figure of 55.6 million persons employed in manufacturing for 1985 in table A.5 either refers to the 'social labour force excluding village level workers' or to 'staff and workers including village level workers'. This point is in need of further clarification.

Annex table A.5 charts the discrepancies in the employment figures from various sources. The *Industrial Economy Statistical Yearbook* figures (SSB, 1993c) for manufacturing are 20 per cent higher than the figure for 'staff and workers' from the *1994 China Statistical Yearbook* (55.6 million against 47.2 million). But the figure is much lower than the social labour force figure of 74.1 million from the *China Statistical Yearbook.*

Total manufacturing employment (average) from the *1985 Industrial Census* (PRC, 1987/88) is 96.8 per cent of the figure from the *Industrial Economy Statistical Yearbook* (53.8 million against 55.6 million).

Further examination of the sources of these discrepancies is urgently needed. They have to do with the following conceptual issues: 'staff and workers' versus 'social labour force', inclusion or exclusion of 'village level activities' and the concept of 'independent accounting units'. Our tentative interpretation is that census and industrial yearbook refer to 'staff and workers' and include village level activities.

For the level comparisons, we consider the census figure for 1985 to be the most trustworthy one, as it comes from the same source as the output figures for that year. If part of employment is excluded, the corresponding output and value added information will also be excluded. For the time series, we have chosen for the data from the *1993 Industrial Economy Statistics Yearbook* (SSB, 1993c). The reasons for this choice are the following. In the first place, the *Industrial Economy Statistical Yearbook* figure for 1985 is very similar to that from the census, in the second place the figures are supposedly based on the census, in the third place, the yearbook is the only source which provides labour inputs by detailed branch of manufacturing. The labour input figures have been reproduced in Annex table A.4.

Table A.4: Employment by Branch of Manufacturing, China, 1980-1992.
(10,000, end of year employment)

ICOP BRANCH	Category of Industry	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
	Total Industry	5028.3	0	0	0	6156.92	6604.5	0	7298.02	7518.08	7545.96	7663.35	7965.23	8008.05
1/2	Food and beverages	269.97	0	0	0	379.47	421.89	0	480.69	494.89	489.16	495.85	510.69	514.22
1	Food manufacturing industry	217.17	0	0	0	295.1	320.21	0	357.27	364.59	362.63	368.06	377.09	377.63
2	Beverage manufacturing industry (a)	52.8	0	0	0	84.37	101.68	0	123.42	130.3	126.53	127.79	133.6	136.59
3	Tobacco processing industry	13.47	0	0	0	21.9	24.18	0	26.71	28.43	29.39	29.61	31.04	32
4	Textile industry	476.12	0	0	0	657.31	721.32	0	852.86	896.32	913.64	928.43	958.35	934.78
5	Clothing industry	135.13	0	0	0	187.34	207.29	0	217.58	216.72	216.96	227.75	242.89	246.83
6	Leather, fur and manufactured products industry	60.02	0	0	0	76.6	86.26	0	97.58	98.53	97.35	102.13	110.27	112.62
7	Wood products and furniture	111.74	0	0	0	143.43	150.42	0	154.49	152.85	151.29	152.93	153.21	149.53
8	Paper, paper products and printing industry	167.12	0	0	0	203.9	219.63	0	249.91	258.67	258.51	264.37	274.92	280.64
9	Oil refining, coal, coking and coal products	35.74	0	0	0	43.25	45.68	0	57.03	62.26	66.62	69.29	79.73	83.93
9	Chemical industry, excluding oil refining	340.86	0	0	0	409.58	428.32	0	483.58	516.39	531.23	557.14	586.67	604.21
	Chemical industry, total	376.6	0	0	0	452.83	474	0	540.61	578.65	597.85	626.43	666.4	688.14
10	Rubber and plastic products industry	134.92	0	0	0	177.73	193.85	0	215.64	226.08	225.96	233.13	246.42	250.88
11	Building materials and other non-metallic minerals	456.1	0	0	0	596.96	664.36	0	739.07	751.35	722.9	698.55	718.14	719.24
12	Basic and fabricated metals	497.95	0	0	0	568.12	599.75	0	662.07	684.8	694.75	702.85	714.66	733.62
13	Machine industry and Transportation equipment	1025.59	0	0	0	1135.19	1184.25	0	1250.24	1281.06	1264.84	1273.12	1312.82	1331.81
14	Electric machinery and apparatus manufacturing	280.54	0	0	0	335.04	364.04	0	402.66	414.19	415.25	428.87	457.35	465.19
15	Other industry	180.86	0	0	0	224.97	244.05	0	301.81	298.69	298.01	307.69	322.63	317.01
	Total manufacturing	4186.13	0	0	0	5160.79	5555.29	0	6191.92	6381.23	6375.86	6471.71	6719.79	6776.51

Source: SSB, 1993 Industrial Economy Statistics Yearbook.

Table A.5: Discrepancies between Estimates of Employment in Industry and Manufacturing, China, 1980-1992 (millions)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total Industry: IESY 1993	50.3				61.6	66.0		73.0	75.2	75.5	76.6	79.7	80.1
Total Industry: CSY 81-85		32.5	34.1	35.0	35.5	35.9							
Total Industry: CSY 1988-90						49.1	51.1	52.8	60.8	42.7			
Total Industry: CSY 1991 (a) (b)						55.6				63.8	63.9		
Total Industry: CSY, 1993 (staff and workers) (b)	47.6	49.8	51.2	52.1	53.4	55.6	57.8	59.7	61.6	62.3	63.8	65.5	66.2
Total manufacturing: IESY 1993	41.9				51.6	55.6		61.9	63.8	63.8	64.7	67.2	67.8
Total manufacturing: CSY 1988-90						41.8							
Total manufacturing: CSY 1991 (estimate) (c)						47.2							
Total manufacturing: CSY 1994 (staff and workers) (b)	39.5	41.3	42.4	43.2	44.4	46.2	48.2	49.9	51.5	52.1	53	54.4	55.1
Total manufacturing: CSY 1994 (social labour force (b)	59.0	61.2	63.3	65.1	70.3	74.1	80.2	83.6	86.5	85.5	86.2	88.4	91.2
Total manufacturing: 1985 Census (d)						53.8							

Sources:
SSB, *1993 Industrial Economy Statistics Yearbook*: 1980, 1984, 1985, 1987-1992.
China Statistical Yearbook, 1981-85: 1981 from Yearbook 1981 or 1983; 1982 from Yearbook 1983 or 1984; 1983 from Yearbook 1984 or 1985; 1984 from Yearbook 1985.
China Statistical Yearbook 1988-90: 1985 from Yearbook 1988 or 1989 or 1990 (see note a); 1986 from 1988; 1987 from 1988 or 1989.; 1989 from 1991 (not from 1990, see note a)
China Statistical Yearbook, 1991: 1985, 1989,1990.
China Statistical Yearbook 1993, Table 4.8: 1980-1992.
China Statistical Yearbook 1994: Social Labour Force (pp. 86) and Staff and Workers (pp. 88 ff.)
1985 Census: 1985.

Notes: (a) In 1991 a total figure of 55.6 persons employed is given for 1985 (five million workers higher than in previous yearbooks). The same figure is also found in the 1993 yearbook. In the 1991 yearbook a total of 63.8 is given for 1989. In the 1990 yearbook the figure is 42.7. Some conceptual changes seem to have been made in the 1991 yearbook.
(b) including village and lower level enterprises
(c) No figure for manufacturing given. We have applied the ratio of manufacturing to total industry from CSY 1988-90
(d) see this paper, p. 10, table 2.

TABLE A.6
Gross Domestic Product by Manufacturing Branch
United States, 1970-1990, in 1982 million US dollars

	Food & Beverages	Tobacco Products	Textile Mill Products	Wearing Apparel	Leather Products and Footwear	Wood Products, Furniture Fixtures	Paper Products, Printing & Publishing	Chemicals, Petroleum & Coal Products	Rubber and Plastic Products	Non-Metallic Mineral Products	Basic & Fabricated Metal Products	Machinery and Transport Equipment	Electrical Machinery and Equipment	Other Manufacturing Industries	Total Manufacturing
1970	44,250	8,625	12,939	15,613	4,389	22,253	49,812	55,402	12,369	18,999	93,774	124,176	34,786	23,408	520,796
1971	45,882	8,829	13,406	15,803	4,391	23,079	51,029	58,686	13,377	19,316	90,593	126,595	34,848	24,137	529,972
1972	48,746	9,066	14,344	18,501	4,530	26,790	54,858	61,608	15,272	21,212	98,448	138,795	38,755	26,970	577,894
1973	52,668	9,461	14,099	19,964	4,902	28,126	60,296	67,667	17,656	23,556	113,333	155,535	44,394	28,449	640,107
1974	47,529	9,566	12,627	18,843	4,716	27,075	57,814	62,634	16,373	22,122	109,614	150,399	41,363	28,462	609,135
1975	48,650	9,910	11,860	18,674	4,511	24,787	53,946	61,594	14,807	20,025	88,468	138,953	38,024	28,964	563,172
1976	51,721	9,882	14,487	20,090	5,042	27,898	58,922	69,948	15,400	22,328	95,970	154,079	41,961	31,051	618,779
1977	51,700	9,500	17,600	20,800	4,800	29,400	62,700	76,500	17,900	22,700	99,400	167,700	50,100	34,100	664,900
1978	56,600	9,900	16,600	21,500	4,900	30,400	65,100	77,800	19,000	23,300	106,200	173,900	56,200	33,300	694,700
1979	59,500	9,900	17,000	21,300	4,200	32,600	65,800	81,600	19,700	23,500	108,700	173,700	60,200	34,400	712,100
1980	59,800	9,600	16,400	21,100	4,300	31,700	62,800	72,900	18,600	21,300	101,900	158,700	63,300	31,600	674,000
1981	58,900	9,900	15,800	20,300	4,400	26,700	64,100	75,800	20,800	20,200	103,600	157,500	64,900	35,900	678,800
1982	61,400	8,900	14,800	18,900	4,100	25,500	65,100	79,700	19,300	18,200	81,600	141,700	61,800	33,700	634,700
1983	62,700	8,000	16,200	20,100	3,800	29,200	68,600	89,500	21,600	19,700	77,700	160,200	64,600	32,600	674,500
1984	62,100	7,800	16,000	20,400	3,600	32,500	70,300	98,900	24,700	21,300	88,200	194,300	73,500	38,900	752,500
1985	64,800	6,200	15,600	20,100	3,200	31,900	72,700	98,500	26,600	22,200	88,900	217,000	74,300	37,200	779,200
1986	65,600	7,000	17,000	21,000	2,700	33,300	74,700	105,700	26,700	22,900	87,000	225,900	74,100	39,700	803,300
1987	66,700	5,200	17,400	22,000	3,000	37,800	78,400	114,500	29,500	22,000	93,700	238,600	82,900	40,600	852,300
1988	69,659	4,880	17,143	22,876	3,171	37,001	80,989	121,536	29,599	23,008	94,557	257,803	91,320	48,566	902,109
1989	67,207	4,160	17,914	24,044	3,171	36,451	81,547	123,474	31,769	23,833	92,612	263,798	98,012	48,737	916,731
1990	70,927	3,760	18,000	23,460	3,086	34,167	82,036	118,966	31,868	23,467	93,043	261,117	98,120	49,182	911,197
1991	70,504	3,400	18,171	23,460	3,086	32,304	80,187	115,661	32,460	21,358	92,765	251,167	101,142	49,556	895,222
1992	70,081	3,120	19,286	23,947	3,343	32,267	80,387	118,154	34,630	22,825	94,193	260,277	100,495	49,147	912,152

Source: GDP from: US Dept. of Commerce, *National Income and Product Accounts of the United States, Vol 2, 1959-88*, Washington D.C., 1992 and *Survey of Current Business*, January 1991, April 1991, November 1992. 1990-92 from Survey of Current Business October 1994;

TABLE A.7
Persons Engaged by Manufacturing Branch
United States, 1970-1992, in 1000 persons

	Food & Beverages	Tobacco Products	Textile Mill Products	Wearing Apparel	Leather Products and Footwear	Wood Products, Furniture Fixtures	Paper Products, Printing & Publishing	Chemicals, Petroleum & Coal Products	Rubber and Plastic Products	Non-Metallic Mineral Products	Basic & Fabricated Metal Products	Machinery and Transport Equipment	Electrical Machinery and Equipment	Other Manufacturing Industries	Total Manufacturing
1970	1810	81	990	1384	323	1213	1853	1219	611	657	2841	3872	1871	988	19,713
1971	1776	77	966	1361	304	1227	1788	1177	607	646	2662	3596	1730	943	18,860
1972	1750	77	1005	1391	302	1287	1805	1165	656	667	2717	3738	1782	986	19,328
1973	1746	79	1037	1430	301	1356	1856	1195	710	706	2918	4055	1967	1049	20,405
1974	1740	79	991	1371	283	1301	1859	1219	706	701	2934	4134	1985	1084	20,387
1975	1691	73	873	1266	252	1121	1784	1215	603	642	2621	3806	1706	1005	18,658
1976	1718	72	922	1353	272	1222	1833	1246	653	661	2689	3904	1783	1047	19,375
1977	1740	70	916	1347	268	1303	1903	1283	720	683	2785	4104	1882	1109	20,113
1978	1762	69	920	1366	272	1364	1966	1308	760	716	2912	4387	2027	1171	21,000
1979	1767	69	896	1331	259	1377	2030	1326	792	732	2992	4637	2129	1193	21,530
1980	1742	68	859	1298	244	1283	2042	1324	733	685	2787	4446	2114	1175	20,800
1981	1715	69	834	1277	252	1249	2062	1330	746	658	2743	4454	2117	1193	20,699
1982	1676	68	759	1190	232	1131	2053	1290	696	590	2381	4052	2034	1156	19,308
1983	1643	65	755	1191	216	1202	2087	1246	716	591	2224	3829	2034	1135	18,934
1984	1634	63	761	1226	199	1289	2171	1238	792	620	2364	4151	2228	1152	19,888
1985	1628	62	714	1151	176	1286	2210	1227	792	609	2265	4226	2208	1146	19,700
1986	1652	58	716	1135	158	1305	2241	1195	798	604	2206	4131	2132	1134	19,465
1987	1668	55	738	1132	153	1357	2284	1194	828	606	2170	4117	2087	1122	19,511
1988	1667	55	740	1123	153	1390	2376	1226	841	619	2223	4194	2197	1148	19,951
1989	1671	52	732	1122	148	1382	2390	1233	863	613	2242	4226	2172	1150	19,995
1990	1684	49	704	1076	142	1350	2410	1254	860	599	2194	4139	2077	1123	19,661
1991	1695	49	681	1047	131	1250	2359	1248	834	564	2096	3955	1976	1087	18,973
1992	1676	48	682	1040	125	1264	2319	1241	848	555	2035	3809	1891	1057	18,590

Source: US Dept. of Commerce, *National Income and Product Accounts, Vol. 2, 1959-1988*, Washington DC, 1992; 1988-1992, US Dept. of Commerce, Survey of Current Business, Washington D.C. Various Issues; 1991 and 1992 from Survey of Current Business, July 1994. From 1987 onward the classification has changed. For each branch we calculate an index of employment with 1987 as base year. We apply this index to the 1987 figures based on the pre 1987 classification, in order to keep the labour input series consistent.

TABLE A.8
GDP per Person Engaged by Manufacturing Branch
United States, 1970-1992, in 1982 US$

	Food & Beverages	Tobacco Products	Textile Mill Products	Wearing Apparel	Leather Products and Footwear	Wood Products, Furniture Fixtures	Paper Products, Printing & Publishing	Chemicals, Petroleum & Coal Products	Rubber and Plastic Products	Non-Metallic Mineral Products	Basic & Fabricated Metal Products	Machinery and Transport Equipment	Electrical Machinery and Equipment	Other Manufacturing Industries	Total Manufacturing
1970	24,447	106,482	13,069	11,281	13,589	18,346	26,882	45,449	20,244	28,917	33,007	32,070	18,592	23,693	26,419
1971	25,834	114,661	13,878	11,611	14,445	18,809	28,540	49,861	22,038	29,902	34,032	35,204	20,143	25,596	28,100
1972	27,855	117,734	14,272	13,300	14,999	20,816	30,392	52,882	23,281	31,801	36,234	37,131	21,748	27,353	29,899
1973	30,165	119,762	13,595	13,961	16,286	20,742	32,487	56,625	24,868	33,366	38,839	38,356	22,569	27,121	31,370
1974	27,316	121,084	12,741	13,744	16,666	20,811	31,100	51,381	23,192	31,557	37,360	36,381	20,838	26,256	29,879
1975	28,770	135,748	13,586	14,750	17,903	22,112	30,239	50,695	24,555	31,191	33,753	36,509	22,288	28,820	30,184
1976	30,105	137,247	15,712	14,849	18,535	22,830	32,145	56,138	23,583	33,779	35,690	39,467	23,534	29,657	31,937
1977	29,713	135,714	19,214	15,442	17,910	22,563	32,948	59,626	24,861	33,236	35,691	40,863	26,621	30,748	33,058
1978	32,123	143,478	18,043	15,739	18,015	22,287	33,113	59,480	25,000	32,542	36,470	39,640	27,726	28,437	33,081
1979	33,673	143,478	18,973	16,003	16,216	23,675	32,414	61,538	24,874	32,104	36,330	37,460	28,276	28,835	33,075
1980	34,328	141,176	19,092	16,256	17,623	24,708	30,754	55,060	25,375	31,095	36,563	35,695	29,943	26,894	32,404
1981	34,344	143,478	18,945	15,897	17,460	21,377	31,086	56,992	27,882	30,699	37,769	35,361	30,657	30,092	32,794
1982	36,635	130,882	19,499	15,882	17,672	22,546	31,710	61,783	27,730	30,847	34,271	34,970	30,383	29,152	32,872
1983	38,162	123,077	21,457	16,877	17,593	24,293	32,870	71,830	30,168	33,333	34,937	41,839	31,760	28,722	35,624
1984	38,005	123,810	21,025	16,639	18,090	25,213	32,381	79,887	31,187	34,355	37,310	46,808	32,989	33,767	37,837
1985	39,803	100,000	21,849	17,463	18,182	24,806	32,896	80,277	33,586	36,453	39,249	51,349	33,650	32,461	39,553
1986	39,709	120,690	23,743	18,502	17,089	25,517	33,333	88,452	33,459	37,914	39,438	54,684	34,756	35,009	41,269
1987	39,988	94,545	23,577	19,435	19,608	27,856	34,326	95,896	35,628	36,304	43,180	57,955	39,722	36,185	43,683
1988	41,787	88,727	23,166	20,371	20,728	26,626	34,083	99,133	35,175	37,198	42,538	61,472	41,572	42,300	45,215
1989	40,220	80,000	24,473	21,430	21,429	26,380	34,116	100,141	36,829	38,860	41,311	62,427	45,125	42,392	45,848
1990	42,118	76,735	25,568	21,803	21,730	25,307	34,035	94,869	37,067	39,197	42,409	63,088	47,238	43,805	46,346
1991	41,596	69,388	26,683	22,407	23,555	25,841	33,989	92,677	38,931	37,855	44,254	63,500	51,182	45,572	47,183
1992	41,815	65,000	28,278	23,026	26,743	25,529	34,663	95,208	40,828	41,141	46,280	68,337	53,140	46,511	49,067

Sources: GDP from US Dept. of Commerce, *National Income and Product Accounts of the United States, Vol. 2, 1959-1988*, Washington DC, 1992; and US Dept. of Commerce, *Survey of Current Business*, January 1991, April 1991, November 1992 and October 1994 issues; Employment from: *NIPA, Vol. 2, 1959-1988*, Washington DC, 1992 and US Dept. of Commerce, *Survey of Current Business*, Washington D.C. Various Issues. GDP and employment 1991 and 1992 from *Survey of Current Business*, October 1994. From 1987 onwards the US series have been reclassficied according to the new SIC classification introduced in that year. For each branch indexes for output and employment for the period 1987-1992 have beeen calculated. We have applied these indexes to the 1987 figures prior to reclassification to keep the long run series consistent.

TABLE A.9
Gross Output, by Major Manufacturing Branch
China and the USA, 1985

	at Chinese unit values			at US unit values			Geometric Average
	China	USA	China/ USA	China	USA	China/ USA	China/ USA (%)
	(in million Yuan)		(%)	(in million US$)		(%)	
Food and Beverages	76,242.4	521,487.5	14.6	53,444.7	301,562.0	17.7	16.1
1 Food Manufacturing	63,386.0	482,243.6	13.1	39,278.5	258,318.2	15.2	14.1
2 Beverages	12,856.4	39,243.9	32.8	14,166.3	43,243.8	32.8	32.8
3 Tobacco Products	8,954.4	7,171.1	124.9	24,290.5	18,506.8	131.3	128.0
4 Textile Mill Products	97,532.6	79,431.4	122.8	67,748.0	53,276.5	127.2	125.0
5 Wearing Apparel	16,380.6	79,748.4	20.5	11,690.0	56,993.1	20.5	20.5
6 Leather Products and Footwear	7,982.7	7,224.7	110.5	9,465.9	8,567.2	110.5	110.5
7 Wood Products, Furniture & Fixtures	9,917.6	148,062.9	6.7	5,728.0	85,478.9	6.7	6.7
8 Paper Products, Printing & Publishing	22,092.6	404,079.3	5.5	13,970.2	205,277.9	6.8	6.1
9 Chemical Products, incl. oil	92,887.2	533,285.7	17.4	77,966.6	376,446.2	20.7	19.0
10 Rubber and Plastic Products	25,385.9	260,209.4	9.8	39,799.1	71,324.0	55.8	23.3
11 Non-metallic Mineral Products	37,525.7	63,218.2	59.4	68,304.6	55,112.0	123.9	85.8
12 Basic & Fabricated Metal Products	89,090.4	165,120.3	54.0	59,790.3	250,110.7	23.9	35.9
13 Machinery & Transport Equipment	124,288.9	1,472,492.8	8.4	64,817.0	516,624.7	12.6	10.3
14 Electrical Machinery & Equipment	56,100.7	162,920.2	34.4	67,345.5	154,898.3	43.5	38.7
15 Other Manufacturing Industries	20,186.6	228,095.9	8.9	17,302.6	126,005.5	13.7	11.0
Total Manufacturing	684,568.3	4,132,547.9	16.6	581,663.0	2,280,183.8	25.5	20.6

Source: Census gvo in national currency from text tables 2 and 3, converted with PPPs from text table 5.

Note (a): The PPPs manufacturing differ slightly from those used for value added, as we used gross output weights, rather value added weights to calculate the PPPs for total manufacturing, see nota (a) to table 5.

TABLE A.10
Gross Output per Person Employed
China and the USA, 1985

	at Chinese unit values			at US unit values			Geometric Average
	China	USA	China/ USA (%)	China	USA	China/ USA (%)	China/ USA (%)
	(in Yuan)			(in US$)			
1/2Food and beverages	20,720	341,101	6.1	13,349	197,250	6.8	6.4
1 Food Manufacturing	22,868	362,120	6.3	12,970	193,973	6.7	6.5
2 Beverages	14,162	199,097	7.1	14,525	219,390	6.6	6.9
3 Tobacco Products	43,864	102,602	42.8	107,766	264,789	40.7	41.7
4 Textile Mill Products	15,746	116,000	13.6	9,919	77,804	12.7	13.2
5 Wearing Apparel	8,664	73,047	11.9	5,851	52,204	11.2	11.5
6 Leather Products and Footwear	10,312	46,817	22.0	11,466	55,516	20.7	21.3
7 Wood Products, Furniture & Fixtures	7,533	133,577	5.6	3,992	77,116	5.2	5.4
8 Paper Products, Printing & Publishing	11,253	194,015	5.8	6,576	98,563	6.7	6.2
9 Chemical Products	23,025	439,913	5.2	16,867	310,535	5.4	5.3
10 Rubber & Plastic Products	14,705	337,501	4.4	21,221	92,510	22.9	10.0
11 Non-metallic Mineral Products	6,092	114,862	5.3	10,351	100,134	10.3	7.4
12 Basic & Fabricated Metal Products	17,551	72,059	24.4	10,280	109,149	9.4	15.1
13 Machinery & Transport Equipment	12,176	362,749	3.4	5,584	127,271	4.4	3.8
14 Electrical Machinery & Equipment	17,697	94,260	18.8	19,055	89,618	21.3	20.0
15 Other Manufacturing Industries	9,240	155,918	5.9	7,352	86,133	8.5	7.1
Total Manufacturing	14,091	219,858	6.4	11,973	121,310	9.9	8.0

Source: Gross value of output from table A.9, employment from text tables 2 and 3.

Table A11.1 - Summary Basic Figures for Total Grain Mill Products, United States (1985 and 1987) and China (1987), in national currency

		Gross Value of Output (a)	Value Added US Census Concept	Value Added National Accounts Concept	Value Added Former National Accounts Concept	Number of Employees
UNITED STATES, 1987			(million US Dollars)			
2041	Flour and Other Grain Mill Products	4,984.8	1,336.7	—	—	13,300
2044	Rice Milling	1,234.9	466.7	—	—	4,500
2046	Wet Corn Milling	4,788.9	2,074.5	—	—	8,600
	TOTAL	11,008.6	3,877.9	—	—	26,400
UNITED STATES, 1987 (Establishments with 20 or more employees)						
2041	Flour and Other Grain Mill Products	4,619.9	1,249.6			12,000
2044	Rice Milling	1,190.5	449.1			4,300
2046	Wet Corn Milling	4732.7	2,051.8			8,350
	TOTAL	10,543.1	3,750.5	—	—	24,650
UNITED STATES, 1985						
2041	Flour and Other Grain Mill Products	5,204.6	1,159.4			
2044	Rice Milling	1,234.9	466.7			
2046	Wet Corn Milling	4,189.7	1,363.4			
	TOTAL	10,629.2	2,989.5			26,400
CHINA, 1985			(million Yuan)			
06101.1	Rice Mills, Cleaning and Polishing of Rice	8,666.6		647.5		
06101.2	Manufacture of Wheat Flour	12,226.9		1,133.1		
06101.3	Bakery Products	1,059		192.5		
	TOTAL	21,952.9		1,973.1		513,731
CHINA, 1985 excl. taxes				(million Yuan)		
06101.1	Rice Mills, Cleaning and Polishing of Rice					
06101.2	Manufacture of Wheat Flour					
06101.3	Bakery Products					
	TOTAL	21,856.2		1,876.4		513,731

Notes: (a) In case of the United States gross value of shipments. In the case of China gross value of output.
(b) Value added in China: net value of output plus depreciation.
(c) Indirect taxes estimated by applying the ratio of indirect taxes to total sales revenues to gross value of output.

Sources: United States (1987) from US Census of Manufactures, Industry Series, table 1a. United States (1985) originally from 1985 Annual Survey of Manufactures China (1985) from Industrial Census 1985, PRC, Vol. 3, p. 90 ff. (gross output and net value added), p. 564 ff. (depreciation).

Table A.11.2 - Basic US Census Listing for Grain Mill Products, 1987

Rank of Item	Code	Product Item	Unit	uantity	Product Value (mill.)	Dollar Unit Value
		FLOUR AND OTHER GRAIN MILL PRODUCTS				|per cwt/| |sh. ton/| |lbs.|
	2041- --	Census Total			4,690.1	
		Our Total			4,689.9	
	20411 --	Wheat flour, except flour mixes			3,218.7	
		White flour:				
		Shipped for export:	1000 cwt.			
18	20411 05	Commercial dollar exports, all white flour types	|	17,310.6	140.6	8.12
	20411 07	All other exports of white flour, such as those under Public Law 480	|	(S)	97.5	
		Domestic shipments:	|			
		Bakers & institutional white bread type	|			
1	20411 11	Shipped in bulk cars or trucks	|	149,500.8	1,326.2	8.87
13	20411 13	Shipped in containers, incl. tote bins	|	23,528.3	256.1	10.88
		Bakers & institutional soft wheat flour, incl. commercial bakery, restaurant, hospital, etc.	|			
9	20411 15	Shipped in bulk cars or trucks	|	38,640.3	320.9	8.30
	20411 17	Shipped in containers, incl. tote bins	|	8,692.7	89.8	10.33
		Family white flour:	|			
		All family flour, excl. self-rising	|			
8	20411 21	Shipped in containers < 25 lbs.	|	29,069.2	358.5	12.33
	20411 23	Shipped in containers >= 25 lbs.	|	9,907.7	99.3	10.02
	20411 26	Self-rising flour	|	3,664.1	66.2	18.07
		Flour shipped to blenders etc.:	|			
	20411 29	For use in food products	|	9,795.5	81.6	8.33
	20411 28	For use in nonfood products	|	3,062.3	16.6	5.42
		Other than white flour:	|			
	20411 31	Whole wheat	|	5,383.4	50.4	9.36
12	20411 51	Durum flour and semolina	|	26,727.8	258.3	9.66
	20411 61	Bulgur	|	(S)	30.1	
	20411 98	Other, incl. farina	1000 cwt.	2,022.7	21.4	10.58
	20411 00	Wheat flour, except flour mixes, n.s.k.			5.2	
	20412 --	Wheat mill products, other than flour			336.9	
10	20412 13	Wheat mill feed	1000 s.t.	5,353.7	298.3	55.72
	20412 19	Other wheat mill products, incl. wheat germ, wheat bran, etc.	| 1000 s.t.	307.4	38.4	124.92
	20412 00	Wheat mill products other than flour n.s.k.			0.2	
	20413 --	Corn mill products			561.1	
		Corn products for human consumption:				
	20413 11	Whole cornmeal	1000 cwt.	(S)	36.8	
17	20413 15	Degermed cornmeal	|	11,856.6	165.3	13.94
	20413 21	Corn grits and hominy, excl. brewer's use	|	8,310.1	54.5	6.56
	20413 23	Corn grits and flakes for brewer's use	1000 cwt.	3,147.9	18.5	5.88
	20413 65	Hominy feed, cornmeal and other byproducts of drycorn milling (for animal feed)	1000 s.t.	823.7	68.9	83.65
	20413 93	Corn flour	1000 cwt.	(S)	118.8	
		Other corn mill products:	|			
	20413 95	For human consumption	|	8,272.0	89.9	10.87
	20413 97	Not for human consumption	1000 cwt.	1,095.5	7.7	7.03
	20413 00	Corn mill products, n.s.k.			0.7	
	20415 --	Flour mixes and refrigerated and frozen doughs and batters, made in flour mills			340.5	
		Flour mixes:				
		Pancake and wafle mixes:	1000 cwt.			
	20415 51	Shipped in containers < 5 lbs.	|	1,653.8	56.3	34.04
	20415 52	Shipped in containers >= 5 lbs.	|	(D)	(D)	

Table A.11.2 - Basic US Census Listing for Grain Mill Products, 1987

Rank of Item	Code	Product Item	Unit	uantity	Product Value (mill.)	Dollar Unit Value
		Cake mixes, incl. gingerbread:				
	20415 53	Shipped in containers < 5 lbs.		(D)	(D)	
	20415 54	Shipped in containers >= 5 lbs.		(D)	(D)	
		Biscuit mixes:				
	20415 56	Shipped in containers < 5 lbs.		(D)	(D)	
	20415 57	Shipped in containers >= 5 lbs.		(D)	(D)	
	20415 60	Pie crust mixes		(D)	(D)	
	20415 63	Doughnuts and other sweat yeast good mixes		(D)	(D)	
		Bread and bread-type roll mixes:				
	20415 66	Shipped in containers < 5 lbs.		(D)	(D)	
	20415 67	Shipped in containers >= 5 lbs.		534.1	18.3	34.26
		Other prepared flour mixes, incl. cookie mixes:				
	20415 72	Shipped in containers < 5 lbs.		(D)	(D)	
	20415 74	Shipped in containers >= 5 lbs.	1000 cwt.	530.3	11.3	21.31
		Refrigerated doughs and batters:				
	20415 81	Biscuit dough	mill. lb.	---	---	
	20415 85	Bread and bread-type roll dough, incl. dinner		---	---	
	20415 87	Other doughs and batters, incl. pizza, coffeecake, pancake, cookie, etc.		(D)	(D)	
		Frozen doughs and batters:				
	20415 91	Bread and bread-type roll dough		(D)	(D)	
	20415 93	Other doughs and batters, incl. pizza, coffeecake, pancake, cookie, etc.	mill. lb.	---	---	
	20415 00	Flour mixes and refrigerated doughs, n.s.k.			---	
	20416 --	Other grain mill products			82.2	
	20416 11	Rye flour	1000 cwt.	1,103.5	9.2	8.34
	20416 23	Other flour, excl. wheat, corn, rye	1000 cwt.	(D)	(D)	
	20416 27	Other mill feed (oats, rye, buckwheat etc.)	1000 s.t.	(D)	(D)	
	20416 00	Other grain mill products, n.s.k.			1.4	
	20410 --	Flour and other grain mill products, n.s.k.			150.5	
	20410 00	Flour and other grain mill products, n.s.k. >= 10 empl.			13.5	
	20410 02	Flour and other grain mill products, n.s.k. < 10 empl.			137.0	
		RICE MILLING				
	2044	Total	mill. lb.		1,257.5	
	20440	Milled rice and byproducts:				
		Head rice not packaged with other ingredients:				
4	20440 11	Packed in 100-pound bags or more		5,387.2	517.7	0.10
	20440 15	Packed in 3-pound containers or less		727.9	106.1	0.15
7	20440 17	Packed in all other containers		3,321.7	446.3	0.13
	20440 21	Second heads		892.2	48.8	0.05
	20440 35	Screenings and brewers' rice		657.4	33.2	0.05
	20440 51	Bran		(S)	14.8	
	20440 99	All other milled rice and byproducts, incl. rice flour	mill. lb.	(S)	65.0	
	20440 00	Milled rice products, n.s.k., typically for establishments with 10 employees or more			8.8	
	20440 02	Milled rice products, n.s.k., typically for establishments with less than 10 employees			16.8	
		WET CORN MILLING				
	2046- --	Census Total			4,446.2	

Table A.11.2 - Basic US Census Listing for Grain Mill Products, 1987

Rank of Item	Code	Product Item	Unit	uantity	Product Value (mill.)	Dollar Unit Value
		Our Total			4,446.3	
	20461 --	Corn sweeteners			2,182.5	
		Glucose syrup, unmixed:				
	20461 03	Type I (20-37 dextrose)	mill. lb.	1,261.4	90.6	0.07
14	20461 04	Type II (38-57 dextrose)	|	3,056.4	231.4	0.08
	20461 13	Type III (58-89 dextrose)	|	677.6	45.0	0.07
	20461 16	Type IV (90 dextrose and above)	|	(D)	(D)	
	20461 17	Glucose syrup solids	|	138.8	27.8	0.20
16	20461 19	Dextrose monohydrate and dextrose anhydrous, incl. crystalline fructose (dry fructose)	|	1,160.3	208.6	0.18
		High fructose corn syrup (HFCS):	|			
6	20461 31	25 up to 50 percent fructose	|	5,404.2	468.3	0.09
2	20461 34	50 up to 80 percent fructose	|	9,050.2	994.0	0.11
	20461 37	80 percent fructose or more	|	(D)	(D)	
	20461 00	Corn sweeteners, n.s.k.	mill. lb.		0.7	
	20462 --	Manufactured starch			774.3	
3	20462 41	Corn starch, incl. milo	mill. lb.	8,107.2	613.2	0.08
	20462 43	Other starch, incl. potato, wheat, rice etc.	|	610.9	106.7	0.17
	20462 47	Dextrin (corn, tapioca and other)	|	(D)	(D)	
	20462 49	Maltodextrins < 20 dextrose equivalents	mill. lb.	(D)	(D)	
	20462 00	Manufactured starch, n.s.k.			9.8	
	20463 --	Corn oil			613.1	
11	20463 53	Crude	mill. lb.	1,186.6	264.0	0.22
	20463 54	Once-refined, after alkali or caustic wash, but before deodorizing or use in end products }	|			
	20463 56	Fully-refined, incl. margarine oil }	|			
	20463 59	Once-refined, purchased and deodorized only}	mill. lb.	(D)	(D)	
	20463 00	Corn oil, n.s.k.			2.9	
	20464 --	Wet process corn byproducts:			845.9	
5	20464 62	Corn gluten feed	mill. lb.	9,064.6	480.3	0.05
15	20464 65	Corn gluten meal	|	1,896.3	213.5	0.11
	20464 72	Gluten (except corn), incl. wheat, rice, potato, etc.	|	669.1	71.3	0.11
	20464 75	Other wet process corn byproducts, incl. steepwater concentrate (50% solids basis)	mill. lb.	1,386.1	80.8	0.06
	20464 00	Wet process corn byproducts, n.s.k.			---	
	20460 --	Wet corn milling products, n.s.k.			30.5	
	20460 00	Wet corn milling products, n.s.k., >= 5 empl.			21.0	
	20460 02	Wet corn milling products, n.s.k., < 5 empl.			9.5	
		TOTAL SPECIFIED 2041,2044,2046				
		- Census Total			10,393.8	
		- Our Total			10,393.7	

Source: US 1987 Census of Manufactures;
Note: (S) More than 30 percent of figure is estimated.
(D) Withheld to avoid disclosing data for individual companies, data are included in higher level totals.

Table A.11.3 - Basic China Census Listing for Grain Mill Products, 1985

Product Item	Unit	Quantity	Yuan Value (million)	Yuan Unit Value
Grain Mill Products				
Milled rice	ton			
Super polished long-grained nonglutinous rice		583,577		
Standard 1 class polished long-grained nonglutinous rice		9,049,030		
Standard 2 class polished long-grained nonglutinous rice		4,846,869		
Standard 3 class polished long-grained nonglutinous rice		218,236		
Super polished round-grained nonglutinous rice		528,055		
Standard 1 class polished round-grained nonglutinous rice		3,294,147		
Standard 2 class polished round-grained nonglutinous rice		684,732		
Standard 3 class polished round-grained nonglutinous rice		128,533		
Polished glutinous rice		832,556		
Other		578,258		
Seed of Food Grains Other Than Wheat and Rice				
Millet		191,484		
Sorghum		135,753		
Polished Barley		40		
Corn grits		333,734		
Other cereal grain, rolled, polished		42,992		
Crude rice		35,510		
Total		21,483,506	8,666.64	403.41
Flour of Wheat				
Superfine flour of wheat		250,472		
Granulated flour of wheat		2,777		
Special type flour of wheat		3,802,088		
? flour of wheat		4,527,316		
Standard flour of wheat		16,344,668		
Ordinary flour of wheat		2,694,614		
Whole flour of wheat		32,576		
Other flour of wheat		693,285		
Rice flour incl.				
incl. Polished long-grained nonglutinous flour of rice		11,703		
Polished round-grained nonglutinous flour of rice		6,384		
Other		(18,087)		
Flour of Food Grains Other Than Wheat and Rice				
incl. Corn flour		1,357,191		
Millet flour		1,527		
Sorghum flour		11,024		
Barley flour		8,809		
Rye flour		14,760		
Buckwheat flour		7,826		
Flour of leguminous vegetables		9,742		
Other		15,246		
		29,773,921	12,226.92	410.66
Flour of Wheat Products		1,791,837		
Milled Rice Products		304,224		
Rice chaff		2,035,569		
Wheat bran	ton	5,568,268		
		9,699,898	1,059.36	109.21

Source: Quantities from Industrial Census 1985, PRC, Vol. 10, p. 132 ff.; Output Values from Vol. 3, p. 90

Table A.11.5 - Matching of Product Items, US-China, Grain Mill Products
(US, 1987) (China, 1985)

Rank	Code of Item	United States Product Item	Unit (a)	US uantity	US Dollar alue (mill. US)	US Dollar Unit alue (per kg. ton)	US uantity alued at China Unit alues (mill. uan.)	PPP uan US US uantity Weights	China Product Item	Unit	China uantity	China uan alue (million uan)	China uan Unit alue (per ton litre)	China uantity alued at US Unit alues (mill. US)	PPP uan. US China uantity Weights
1.		RICE MILLING													
	2044	Total	ton												
	20440	Milled rice and byproducts:													
		Head rice not packaged with other ingredients:													
	20440 11	Packed in 100-pound bags or more		2,445,788.8	517.7	211.67									
	20440 15	Packed in 3-pound containers or less		330,466.6	106.1	321.06									
	20440 17	Packed in all other containers		1,508,051.8	446.3	295.94									
	20440 21	Second heads		405,058.8	48.8	120.48									
	20440 35	Screenings and brewers' rice	ton	298,459.6	33.2	111.24									
				4,987,826	1,152	230.98	2,012.13	1.75	Milled rice (b)	ton	20,743,993				
									Crude rice (b)	ton	35,510				
									Total		20,779,503	8,382.6	403.41	4,800	1.75
2.		FLOUR AND OTHER GRAIN MILL PRODUCTS													
		White flour:													
		Shipped for export:	1000 t.												
	20411 05	Commercial dollar exports, all white flour types		785.9	140.6	178.90									
		Domestic shipments:													
		Bakers & institutional white bread type													
	20411 11	Shipped in bulk cars or trucks		6,787.3	1,326.2	195.39									
	20411 13	Shipped in containers, incl. tote bins		1,068.2	256.1	239.75									
		Bakers & institutional soft wheat flour, incl. commercial bakery, restaurant, hospital, etc.													
	20411 15	Shipped in bulk cars or trucks		1,754.3	320.9	182.93									
	20411 17	Shipped in containers, incl. tote bins		394.6	89.8	227.54									
		Family white flour:													
		All family flour, excl. self-rising													
	20411 21	Shipped in containers < 25 lbs.		1,319.7	358.5	271.64									
	20411 23	Shipped in containers >= 25 lbs.		449.8	99.3	220.76									
	20411 26	Self-rising flour		166.4	66.2	397.96									
		Flour shipped to blenders etc.:													
	20411 29	For use in food products		444.7	81.6	183.49									
	20411 28	For use in nonfood products	1000 t.	139.0	16.6	119.40									
				13,310	2,756	207.05	5,460	1.98	Flour of Wheat (c)	ton	28,347,796	11,629	410.23	5,869	1.98

Table A.11.5 - Matching of roduct Items, US-China, rain Mill roducts
(US, 1987) (China, 1985)

Rank	Code	United States roduct Item	Unit (a)	US uantity	US Dollar alue (mill. US)	US Dollar Unit alue (per kg. ton)	US uantity valued at China Unit alues (mill. uan.)	uan US US uantity Weights	China roduct Item	Unit	China uantity	China uan alue (million uan)	China uan Unit alue (per ton litre)	China uantity valued at US Unit alues (mill. US)	uan. US China uantity Weights
3.															
	20413 15	Degermed cornmeal	1000 t.	538.3	165.3	307.08									
	20413 21	Corn grits and hominy, excl. brewer's use	|	377.3	54.5	144.46									
	20413 23	Corn grits and flakes for brewer's use	|	142.9	18.5	129.45									
	20413 65	Hominy feed, cornmeal and other byproduct	|												
		of drycorn milling (for animal feed)	|	747.1	68.9	92.22									
		Other corn mill products:	|												
	20413 95	For human consumption	|	375.5	89.9	239.38			Corn grits (d)	ton	333,734	134.6	403.41		
	20413 97	Not for human consumption	1000 t.	49.7	7.7	154.82			Corn flour (c)	|	1,357,191	557	410.23		
				2,231	405	181.45	912.16	2.25	Corn flour (c)	ton	1,690,925	691	408.88	307	2.25
4.															
	20416 11	Rye flour	1000 t.	50.1	9.2	183.64	20.55	2.23	Rye flour (b)	ton	14,760	6.05	410.23	2.71	2.23
Total matched items					4,321.9		8,405.0	1.94				20,709.2		10,978.6	1.89
in % of total specified and unspecified output					39.26%							94.33%			
TOTAL MATCHED ITEMS adjusted for Chinese taxes					4,321.9		8,368.0	1.94				20,618.0		10,978.6	1.88

Notes: (a) US quanties converted to metric units

(b) Only one value for rice, millet, sorgum, barley and corn grits. Rice accounts for 96.7% of total quantity. Therefore we took the same percentage of the value of output.

(c) Only one value for all flour products. We assume all flour products have the same unit value in China. We make separate matches with US products, using this unit value.

(d) using average price of rice mill products in match 1

Table A.11.5a Volume Movements in the United States, Grain Mill Products, 1985-1987

		Gross Value of Output (million 1982 US$) according to Industrial Outlook		Ratio of 1985 to 1987 Quantity for Gross Output	Gross Value of Output (million 1987 US$) according to		Ratio of 1985 to 1987 Quantity for Gross Output
		1987	1985		Census Valuation 1987	Our Estimate 1985	
2051	Bakery Ex Cookies	13,305	12,756	0.96	16,202.1	15,533.6	
2052	Cookies and Crackers	5,251	5,559	1.06	6,309.1	6,679.2	
	TOTAL				22,511.2	22,212.7	0.99

Source: Gross value of shipments at 1982 US$ from US Dept, of Commerce, 1989 US Industrial Outlook, Washington D.C. Census valuation of output at 1987 US$ from the 1987 U.S. Census of Manufacture Since data for SIC 2041, 2044 and 2046 are not available, we have to use data for SIC 2051 and 2052 as proxy to conduct our calculation.

Table A4.5b Price Movements in the United States, Grain Mill Products, 1985-1987

		Gross Value of Output in 1985 according to ASM (1985 US$)	Our Estimate (1987 US$)	Ratio of 1985 to 1987 Prices for Gross Output
2051	Bakery Ex Cookies	14,388.5	15,533.6	0.93
2052	Cookies and Crackers	6,445.9	6,679.2	0.97
		20,834.4	22,212.8	0.94

Source: Gross Value of Output at 1985 US$ from US Dept. of Commerce, Annual Survey of Manufactures

Table A.11.6 - Basic Data and Principal Results for Total Grain Products, USA and China

		China	United States	China/USA
Part I - Basic data used in Calculations				
I.1	Total Gross Value of Output, 1985 in 1985 million national currency units	21,856.2	10,629.2	
1.2	Total Gross Value of Output, 1987 in 1987 million US dollars		11,008.6	
I.3	Matched Gross Value of Output, 1985			
	a) in 1985 million Yuan	20,618.0		246.4%
	b) in 1987 million US dollars	10,978.6		254.0%
1.4	Matched Gross Value of Output, 1987			
	a) in 1985 million Yuan		8,368.0	
	b) in 1987 million US dollars		4,321.9	
I.5	Coverage ratio Matched Output to Total Gross Value of Output, (%)	94.3%	39.3%	
1.6	1985 US Output Volume as a % of 1987		98.7%	
1.7	1985 US Unit Values as a % of 1987		93.8%	
1.8	Matched Gross Value of Output in 1985			
	a) in 1985 million Yuan	20,618.0	8,257.0	249.7%
	b) in 1985 million US dollars	10,297.3	4,000.0	257.4%
I.9	Value Added (US Census Concept), 1985 in 1985 million national currency units	1,876.4	2,989.5	
I.10	1985 Ratio of Value Added (US Census Concept) to Gross Value of Output	8.59%	28.13%	
I.11	Employment 1985	513,731	26,400	1946.0%
I.12	1985 Exchange Rate (national currency/US$)	2.9	1.00	
Panel II - Principal Results, 1985 in all cases				
II.1	Purchasing Power Parity for (Matched=Total) Gross Value of Output (national currency/US$)			
	a) Chinese quantity weights	2.00	1.00	
	b) US quantity weights	2.06	1.00	
II.2	Total Gross Value of Output			
	a) Chinese unit value weights, (mill. Yuan)	21,856.2	21,941.6	99.6%
	b) US unit value weights, (mill. US$)	10,915.7	10,629.2	102.7%
II.3	Value Added (US Census Concept)			
	a) Chinese unit value weights, (mill. Yuan)	1,876.4	6,171.2	30.4%
	b) US unit value weights, (mill. US$)	937.1	2,989.5	31.3%
II.4	Gross Output per Employee,			
	a) Chinese unit value weights, (Yuan)	42,544	831,122	5.1%
	b) US unit value weights, (US$)	21,248	402,621	5.3%
II.5	Value Added (US Census Concept) per Employ			
	a) Chinese unit value weights, (Yuan)	3,652	233,756	1.6%
	b) US unit value weights, (US$)	1,824	113,239	1.6%

Source: Lines I.1, I.2 and I.9 to I.11 derived from table A11.1; lines 1.3 to I.8 from from tables A11.4 and 5. Exchange rates from World Tables, 1988-89. The figures in Panel II are all derived from the basic data in panel I.

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